

PRESCRIPTION ACCURACY AS SHOWN BY STATE BOARD OF
PHARMACY EXAMINATIONS—A PRELIMINARY STUDY.*

BY ROBERT L. SWAIN.

As a member of the Committee on Prescription Tolerances, appointed by President W. Bruce Philip, of the AMERICAN PHARMACEUTICAL ASSOCIATION, I requested the Maryland Board of Pharmacy to cooperate by turning over to me certain prescriptions compounded by applicants appearing before the Board on June 5th. Two prescriptions constitute the basis for this preliminary report:

- (a) Sodium Bicarbonate
Charcoal Powd. āā grains lxxv
To be made into ten powders.
- (b) Quinine Sulphate
Aloes Pulv. āā grains x
To be made into ten pills.

The various powders and pills, turned in by thirty-five applicants for the practical examination, were carefully checked and weighed upon analytic balances in the Bureau of Chemistry of the Maryland State Department of Health. The results show the weight of each powder or pill turned in by each applicant. This permits a full consideration of the work done by each compounder, including the variations existing between the individual powders and pills in each instance. It was thought that such a procedure would strongly indicate the skill and accuracy with which the prescriptions were compounded.

Simply as an effort to present a fair opinion upon the results obtained, eleven of the prescriptions for powders were accepted as satisfactory. The basis for acceptance was more or less indefinite, and depended largely upon my own conception of what degree of accuracy should prevail. However, before arriving at the final conclusion, I gave careful scrutiny to the entire number of powders, and simply selected the number that appeared to me to be more uniform in weight, more closely conforming to the average weight, and showed less deviation in weight as between individual powders. Twenty-four of the prescriptions were not considered acceptable when judged in the same manner. It should be added that no information is available regarding the methods of division. The results in some cases were so uniform as to indicate that each powder was weighed. As a rule, however, the facts suggested division in the usual manner.

I should like to say here that some very valuable studies of prescription compounding have been made by Prof. Marvin J. Andrews of the School of Pharmacy, University of Maryland. Some of his findings have been published, or will be published in the JOURNAL OF THE AMERICAN PHARMACEUTICAL ASSOCIATION. He has worked out the average standard deviation for several frequently met with prescriptions. I shall not discuss his procedure, as it is a bit complicated and exceedingly laborious, but I suggest that his results be carefully studied as it is a constructive and fundamental piece of work. Applying Professor Andrew's conclusions to the powder prescription discussed here, it is shown that each powder should contain not less than 13.92 grains.

* Section on Practical Pharmacy and Dispensing, A. Ph. A., Madison meeting, 1933.

The prescriptions for pills were more consistently satisfactory than the powders. Only four were regarded as altogether unsatisfactory. I might add that the basis for acceptance was almost entirely uniformity in weight. The excipient was not specified, and this made it impossible to consider difference in weight as between different compounders.

PILLS CONSIDERED SATISFACTORY.

No. 1:	2.70	2.70	2.71	2.82	2.96	2.98	3.12	3.13	3.26
No. 2:	3.64	3.70	3.77	3.78	3.87	4.00	4.07	4.07	4.26
No. 3:	2.10	2.42	2.45	2.69	2.78	2.79	2.82	2.89	3.01
No. 4:	2.25	2.28	2.47	2.50	2.68	2.68	2.76	2.78	2.93
No. 6:	2.33	2.42	2.47	2.58	2.62	2.67	2.79	2.79	2.84
No. 8:	2.42	2.48	2.50	2.61	2.67	2.82	2.98	3.01	3.04
No. 17:	3.40	3.66	3.70	3.86	3.89	3.90	4.04	4.21	4.21
No. 20:	2.39	2.50	2.59	2.59	2.62	3.64	2.68	2.81	2.87
No. 23:	2.19	2.48	2.58	2.75	2.82	2.81	2.90	2.99	3.10
No. 24:	2.18	2.24	2.31	2.39	2.41	2.44	2.44	2.70	2.72
No. 26:	2.38	2.70	2.76	2.78	2.79	2.93	2.90	3.01	3.16
No. 28:	2.07	2.08	2.21	2.23	2.30	2.32	2.35	2.38	2.49
No. 29:	1.74	2.24	2.30	2.44	2.45	2.49	2.56	2.65	2.69
No. 30:	2.18	2.22	2.28	2.31	2.33	2.35	2.41	2.50	2.53
No. 31:	3.02	3.07	3.21	3.47	3.50	3.60	3.64	3.72	3.78
No. 32:	2.38	2.47	2.59	2.65	2.70	2.73	2.76	2.78	2.93
No. 34:	2.13	2.16	2.21	2.34	2.45	2.50	2.56	2.56	2.59
No. 37:	2.56	2.72	2.80	2.96	3.13	3.24	3.26	3.38	3.53
No. 40:	2.10	2.16	2.22	2.25	2.25	2.30	2.41	2.41	2.95
No. 42:	2.55	2.55	2.59	2.72	2.72	2.72	2.78	2.93	3.12
No. 44:	2.04	2.16	2.36	2.42	2.42	2.50	2.56	2.70	3.09
No. 46:	2.75	2.89	2.90	2.99	3.01	3.02	3.02	3.04	3.07
No. 47:	3.41	3.07	3.32	3.36	3.36	3.41	3.46	3.53	3.80
No. 48:	2.62	2.90	2.96	3.13	3.15	3.35	3.36	3.38	3.49
No. 50:	2.42	2.62	2.62	2.78	2.81	2.82	2.92	2.93	2.99
No. 51:	3.05	3.27	3.29	3.29	3.39	3.44	4.52	3.90	3.93
No. 52:	2.73	2.85	2.92	3.06	3.09	3.11	3.18	3.32	3.39
No. 53:	1.93	1.93	2.05	2.14	2.19	2.21	2.21	2.22	2.24
No. 56:	3.10	3.26	3.39	3.53	3.53	3.73	3.73	3.90	3.92
No. 58:	2.61	2.65	2.65	2.85	2.90	2.96	2.98	3.09	3.33
No. 60:	2.67	2.85	2.90	2.93	2.96	3.07	3.09	3.15	3.19

PILLS CONSIDERED UNSATISFACTORY.

No. 5:	1.43	1.43	1.50	1.54	1.54	1.59	1.61	1.68	1.96
No. 25:	1.81	1.81	1.87	1.90	1.98	2.02	2.07	2.07	2.21
No. 41:	1.42	1.45	1.50	1.57	1.57	1.62	1.65	1.67	1.79
No. 57:	1.16	1.23	1.23	1.26	1.28	1.31	1.40	1.40	1.57

I am presenting this report as a preliminary study. I do not know just how valuable this data may prove to be in arriving at a conclusion as to what degree of accuracy should prevail in prescription practice, but I am certain it will be of suggestive value. In fact, a full study of the whole field of prescription compounding may well prove that no arbitrary standard can be set up. At any rate, the study will be continued until definite and authoritative conclusions are possible.

POWDERS CONSIDERED SATISFACTORY.

No. 3:	11.84	12.66	13.16	13.33	13.46	13.89	15.97	16.28	16.52	18.73
No. 8:	13.76	14.06	14.34	14.41	14.47	14.55	14.65	14.76	14.95	15.21
No. 17:	15.66	15.71	15.85	16.25	16.66	16.70	16.77	16.77	16.79	16.80
No. 34:	13.29	14.10	14.59	14.50	14.62	14.79	15.25	15.27	15.50	16.48
No. 42:	12.56	14.04	14.52	14.88	15.00	15.01	15.01	15.50	15.69	16.71
No. 46:	12.43	12.94	15.07	15.20	15.45	15.79	16.61	16.77	16.97	17.05
No. 47:	14.01	14.45	14.56	14.85	15.11	15.15	15.28	15.41	15.45	16.86
No. 48:	12.15	12.41	13.57	13.36	13.87	13.89	13.98	14.12	15.27	15.39
No. 50:	12.76	13.61	13.65	13.87	14.07	14.52	15.59	15.94	16.49	17.49
No. 51:	13.18	13.27	13.87	14.29	14.98	15.00	15.30	16.13	16.52	16.90
No. 53:	14.49	14.59	14.92	15.12	15.33	15.35	15.35	15.56	15.70	17.00

POWDERS CONSIDERED UNSATISFACTORY.

No. 1:	9.06	9.66	13.25	14.48	15.54	16.06	16.25	16.45	16.59	18.78
No. 2:	11.45	12.51	12.84	13.96	14.07	15.19	15.30	15.36	16.15	16.16
No. 4:	14.78	16.06	16.56	16.90	17.58	17.85	18.01	18.18	20.41	26.38
No. 5:	11.67	12.02	12.91	14.43	14.60	15.45	15.62	16.02	16.56	17.26
No. 6:	11.70	12.01	12.99	13.01	13.24	13.48	13.61	13.95	14.04	15.06
No. 20:	11.49	12.68	13.50	13.92	14.17	14.96	15.65	15.80	16.43	17.85
No. 23:	10.33	10.75	10.88	13.05	13.21	14.56	14.58	15.35	19.15	19.36
No. 24:	8.93	10.86	12.45	12.52	13.46	15.32	15.45	16.25	16.88	17.01
No. 25:	10.65	11.92	12.11	12.49	13.01	13.32	15.08	15.38	15.73	15.73
No. 26:	8.31	11.56	12.52	13.17	14.80	15.37	15.60	17.07	17.45	19.32
No. 28:	10.31	11.82	12.06	12.19	12.82	13.19	13.40	13.71	14.21	14.56
No. 29:	10.65	12.21	12.86	13.65	15.19	15.70	16.00	16.32	16.51	16.79
No. 30:	10.15	10.31	10.74	11.06	11.46	11.68	11.92	12.46	12.60	13.27
No. 31:	11.54	12.25	12.97	13.40	13.84	14.35	14.44	15.09	15.27	15.87
No. 32:	9.98	11.32	11.35	11.71	12.19	12.99	13.43	13.55	13.71	14.78
No. 37:	12.04	12.73	13.38	13.65	13.76	14.05	14.20	14.38	14.90	15.41
No. 40:	11.64	12.20	12.90	13.10	13.27	13.35	13.70	14.01	14.23	15.19
No. 41:	10.11	10.95	13.00	13.04	13.34	13.83	14.14	14.30	15.33	15.35
No. 44:	10.18	11.00	11.82	12.45	12.60	13.75	14.07	14.48	14.61	15.82
No. 52:	12.59	12.78	12.80	13.64	14.74	15.56	15.56	16.15	16.67	17.67
No. 56:	11.64	12.57	12.65	12.80	12.83	12.93	13.10	13.68	14.36	15.21
No. 57:	12.08	12.76	12.91	13.34	13.45	13.58	14.06	14.12	14.48	15.43
No. 58:	10.19	11.94	12.18	12.82	13.05	14.08	15.94	16.80	16.99	18.90
No. 60:	12.35	13.05	13.59	14.66	14.85	15.29	15.35	15.84	16.05	17.61

ABSTRACT OF DISCUSSION.

E. D. Stanley inquired whether accuracy had any relation to the ingredients. The author hoped that greater accuracy would be obtained with more potent ingredients; he stated that there is unlimited possibility of deviation; his conclusions were based on the weight of the finished product. In reply to a question, the author stated that he has been making a study of the legal aspects of such deviations; he cited a Maine case where the work had been carelessly done. The Court reviewed the various methods of weighing powders and observed that the customary method of the profession may be wrong; hence, it is not merely an academic question; the most accurate method is that of weighing the individual ingredients.

D. F. Jones asked if the error, in many cases, might not be attributable to trituration. **Mr. Swain** expressed his interest in the work of **Mr. Andrews**; the work is done with uniform apparatus and under uniform conditions, none of the variables of the pharmacy are present; this work is to determine tolerance under ideal as well as under adverse or average conditions, in the laboratory.

I. A. Becker, **Rowland Jones**, **Marvin Andrews** and **L. W. Rising** discussed balances and graduates; other discussions related to the variance in therapeutic results due to variation in weights and measures.

BINDING UP A WOUND.

BY FRED B. KILMER.

(Continued from page 1126.)

The name of a Glasgow surgeon, Joseph Lister, is associated with the inception of antiseptic surgery. Lister was not the creator of antiseptics, nor the inventor of antiseptic wound dressing. He merely organized and applied the researches which had gone before. His famous carbolic dressings hark back to the tar and pitch of ancient Egypt. Antiseptic applications to wounds had been made sporadically through the centuries. Lister erected them into a system. Lister impregnated lint, bandages, cotton and gauze with antiseptics, and applied them to wounds. Suppuration was banished and the wounds healed. Simple, but wonderfully effective. Even under the now-considered crude and cumbersome methods of Listerism, the mortality in major operations at once dropped from a range of 45-65 per cent to the then marvelously low figure of 6 per cent. Truly a surgical revolution.

Lister's measures were in essence methods of cleanliness. The antiseptics were cleansing agents, "angels of cleanliness." Infecting organisms, bacteria or germs present on the hands, instruments or skin of the patient were destroyed and their growth was prevented. Wounds healed rapidly—by first intention. No inflammation—no pus—no gangrene—no infection.

This was a wild idea, according to Lister's fellow surgeons. Nobody believed it possible, except Lister's wife, who helped him to do it. Lister devised a system of dressings and methods that turned the surgical world completely around. He sprayed the air with a carbolic solution that set everybody choking and coughing. This he soon abandoned as unnecessary. He dipped lint and gauze in solutions of boracic acid, carbolic acid, corrosive sublimate and other germ-destroying agents, and covered the wounds with them. Thus, in Lister's kitchen, with the aid of Lady Lister, a wash tub and a clothes wringer, began the great system of antiseptic pads, bandages, cottons, gauzes and dressings which later played so large a part in wound healing.

The idea, however, did not go over easily. Lister's English colleagues fought hard against the methods. French surgeons took to it more kindly, but not with rapidity. The German surgeons adopted it enthusiastically, and added iodoform, salicylic acid, mercury compounds and a dozen other antiseptic chemicals. The American surgeons held aloof. A few of them went overseas and came back convinced. For the most part, the profession in our land for a time rigidly ignored, then took it up, and carried it forward eagerly.

As the years went on, Lister, weakening his solutions, modified his methods. While the foundation principles of Listerism were not changed, and still remain, the pads, bandages and dressings were to a degree modified and changed from *antiseptic* to *aseptic*.

If we study the meaning of a few words, perhaps we shall better understand the change:

Antiseptic—Anti—against; sepsis—poison; an antiseptic dressing contains a substance which will either destroy or prevent the growth of a living organism (a germ) which will produce infection or poison.

Aseptic—A—free from; sepsis—poison; an aseptic dressing is one which is free from any living organism (germ) which will produce infection or poison.

A *sterilized* dressing is one which by passing through some process (heating etc.) which has destroyed any living organism (germ) is rendered sterile.

One could take a bandage, dip it in a solution of carbolic acid—an antiseptic, wash away the carbolic acid, and there would remain an *aseptic or sterile* bandage.

If we steamed, boiled or heated a bandage it would become *aseptic or sterile*.

Thus Lister's antiseptic dressings in the course of time were transformed into *aseptic or sterile* dressings.

Lister himself heated some of his dressings and made them sterile. But he preferred to use dressings which were impregnated with antiseptics.

The Continental surgeons still, to a considerable extent, use antiseptic dressings. They have adopted many of the newer antiseptics. American surgeons, in the larger part, employ aseptic material sterilized by heat (steam pressure).

In addition to the use of sterile or aseptic material in surgery, elaborate and somewhat complicated methods are employed in the sterilization of apparatus, instruments, the cleansing of the field of operation and of the hands and clothing of the operator, etc. The objective is to keep out or destroy deleterious organisms and protect the wound from infection.

First aid to the injured took orderly shape under Listerism. First aid in its true aspect means that when a person is injured, and especially when the flesh is broken, the wounded part shall at once be covered with a suitable bandage to prevent further injury, and specifically to prevent the entrance of the germs of infection into the broken flesh. Slowly the idea spread—at first in industry, where it was found that first-aid measures would reduce the extent of the injury, prevent infection, and result in a saving of money loss in wages, compensation, etc. Many states in the Union now require that industries shall have at hand suitable bandages and dressings for the prompt application of first aid. Railway and transportation lines also provide equipment, including bandages for the application of first aid. In military practice every soldier carries attached to his belt a package of dressings for use on the battle-field.

A feature of first-aid bandaging is the use of the famous triangular bandage. Originating in the ancient use of the handkerchief in wound dressing, the modern triangular bandage was introduced in 1832. The renowned surgeon, Esmarch of Kiel, added the printing of illustrations upon the bandage showing its application. It is now known as the Esmarch bandage. It is used extensively in military and in lay first aid.

First-aid outfits are supplied for factory, shop, home, automobile and transportation vehicles.

The treatment and after-care of injuries, the administration of medicines, the diagnosis and treatment of disease are no part of first-aid work. The first-aid worker covers the wound with a bandage and stops.

When the present era of surgery arrived, the principal dressing materials in use were lint, non-absorbent cotton, muslin, linen and flannel bandages. In a limited way these materials are still in use. With the antiseptics of Lister and the later modification to asepsis, cotton was made absorbent. Cheese-cloth was converted into what we now term "absorbent" or "surgical" gauze. Some years

prior to the World War absorbent paper in sheets was introduced under the name of "cellulose wadding" as a substitute for cotton. Paper tissue is absorbent, but it lacks the elasticity of cotton fibre. Paper has been spun into a thread and woven into a fabric. For mechanical uses, especially, adhesive masses have been spread upon paper fabrics. In recent times some of the newer fabrics, including rayon, crepes, elastic fabric of rubber and cotton, cellophane and metallic foils, have been brought into use. And at the present time we have cotton, gauze and paper made into sheets, pads, compresses, napkins, sponges, tampons, bandages and other forms without end. These are used in surgery, dentistry and in the shop and the household. In modern times the use of cotton, gauze and even adhesive plaster for toilet, household and mechanical purposes rivals and in some instances exceeds the consumption in surgery.

The rapid introduction of the Listerian dressings and the present-day sterile or aseptic dressings has been due to the enterprise of the manufacturers, greatly aided by their distribution through the drug trade. Lister made his own dressings. Upon their acceptance in this country the hospitals undertook to make them for their own use. A few surgeons installed in their offices apparatus for impregnating gauze with antiseptics, machines for cutting and rolling bandages, etc.

The British and the U. S. Pharmacopœias recognize absorbent cotton. The British Pharmaceutical Codex establishes standards for various gauzes and dressings under the designation "Carbasus." In several of the foreign Pharmacopœias absorbent cotton is official.

Hager's "Handbuch der Pharmaceutischen Praxis" contains a chapter on "Verbandstoffe" in which the preparation of surgical dressing material including cotton, gauze, bandages and ligatures is outlined, and instructions are given for their impregnation with antiseptics and sterilization. Illustrations of apparatus for the preparation of these materials are shown. In many pharmacies in Germany and Continental countries the preparation of these dressings is a prominent activity.

The pharmacist has been an important factor in this phase of the progress of surgery and surgical dressings. He has been the distributor. Through the agency of the retail druggist the surgeon in any remote corner of the land can obtain the type of dressing needed. Without the druggist's kindly aid, surgical progress would have been slow.

Rather lamentable is the fact that the pharmacist has been content to remain simply a distributor of surgical dressing material. For the most part, he has failed to make himself a factor in surgical progress. He left it to the manufacturer to fabricate and exploit new forms of dressings. He did not keep pace with the increased use of these materials stimulated by the great first-aid movements that have encompassed the land. He dispensed over the counter that which the buyer asked for, and let it go at that.

Such a condition still prevails. In the up-to-date drug store we see counters, show-cases and windows filled with cut-rate medicines returning little or no profit. On the other hand, bandages, cotton, gauze, wound dressings and first-aid materials which afford a fairly long range of profits are put under counters and in closets—out of sight. They are not shown, nor is their sale pushed. One druggist, when asked the reason for this custom, replied: "When customers come into my store I don't

want them to think about such unpleasant things as sickness, accidents or injuries." And so the exploitation of bandages, gauze, cotton, etc., is taboo.

In taking this attitude, the druggist overlooks the fact that increased sale of this class of items would add to his reputation, prestige and profits. They are in reality "home needs," "home necessities," capable of a greatly extended use. While their use in caring for wounds and injuries is large, their use in the arts, the home, the shop and other walks of life is extending daily. For absorbent gauze or so-called "surgical gauze" there are a thousand uses in the ordinary paths of life entirely foreign to wound dressing. Many times more absorbent cotton is being used in the household and shop than in wound treatment. Beyond the medical and surgical uses of adhesive plaster lies a field of mechanical uses far exceeding all other forms of application, and seemingly unlimited. The agency of the retail druggist in the distribution of these items for surgical use stands to his credit. It is to be feared that he has not kept pace with their more modern uses. He has in a great measure allowed the trade to slip over to the dry goods store, the hardware dealer and the knick-knack shop.

The art of binding up a wound begins with primal man. Through the ages it has developed slowly, following the changes in civilization and the advancement of the surgical art. Certain forms of bandages and methods of application have been carried through the centuries. The trend of modern surgical practice is toward the simplification of bandages and dressings. The amount of material used per individual operation has notably decreased. This is balanced by the increase in the number of operations performed.

The embalmers and the barber surgeons were important factors in the development of surgical bandages. The apothecary or pharmacist, either when merged with the medical art or when separated from it, has been a factor in the preparation and application of surgical dressings. In modern times the rôle of the pharmacist is largely that of a distributor.

PUBLICITY AND THE PHARMACIST.*

BY ALICE-ESTHER GARVIN.

The attitude of most pharmacists toward unfavorable publicity reminds me of the man who kept hitting himself on the head with a hammer because it felt so good when he stopped. We have emerged from the Victorian and early Georgian period of overweening modesty, and it would seem not only feasible but absolutely essential that the present-day pharmacist seek favorable publicity not only for his profession in general, but also for himself. The slogan, "Your pharmacist is more than a merchant" has been helpful, but we need more and more news about the individual druggist—about you men in this audience to-day. As Byron so aptly said,

"Words are things, and a small drop of ink
Falling, like dew, upon a thought, produces
That which makes thousands, perhaps millions, think,"

* Section on Commercial Interests, A. P. H. A., Madison meeting, 1933.

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