to their homes of an additional 60 patients. It has reduced the number of beds available to mental welfare officers for urgent admissions and has increased the need for new facilities in the community.

The results of a small emergency unit devoted to early treatment has considerable interest and importance at this stage of hospital planning. The larger units like Oldham and Bolton are well known. More recently Cohen and Haldane (1962) and Dunkley and Lewis (1963) described the needs of such units. A psychiatric unit of 24 beds for the reception and treatment of acute and disturbed psychiatric patients is described here. It is able to deal effectively with at least two-thirds of the cases without limitations regarding diagnostic categories or age of patients, with a minimum of noise and disturbance to its immediate environment, and without the necessity of the rehabilitation facilities of a modern mental hospital. A similar unit could function within the walls of any general hospital and provide there the much needed psychiatric services of the community. It has been held that small psychiatric units of 30 beds or less can deal with only one type of psychiatric disorder, which view has been disproved by the above results (see Table IV). No direct conclusions can be drawn from this paper about the optimal size and staffing of acute psychiatric units other than the indication that increase beyond 30 beds would diminish the close contact between patients, their families, and staff—which we regard as of paramount importance for success.

Some psychiatrists would regard the absence of medium- and long-stay beds as detrimental to any psychiatric unit established in a general hospital. While we agree that a divorce of psychiatric services into acute and chronic

should be avoided rather by combined staffing than by geographical proximity, we advance the view tentatively that rapid treatment will prevent most of the need for chronic beds as well as forestall the rejection of the psychiatric patient by his community. For this the community care provided by an enlightened local authority will be most essential. For this unit the excellent help of the London County Council can be relied upon: it provides individual aftercare, group meetings, social clubs, day centres, and occupation centres.

Summary

The effect of the Mental Health Act, 1959, on the admissions and management in an observation ward are described, comparing two cohorts comprising all admissions in 1955–6 with those in 1960–1. Informal admissions accounted for 45% of all cases in 1960–1 against none in 1955–6.

The change of policy from traditional observation ward to early treatment unit resulted in an average longer stay by five days, and reduction in numbers dealt with. The proportion of patients discharged direct to their homes has doubled. The relevance of the results of this unit for the planning of psychiatric units in general hospitals and community services is outlined.

REFERENCES

- Cohen, N. A., and Haldane, F. P. (1962). *Lancet*, **1**, 1113.
Dunkley, E. W., and Lewis, E. (1963). *Ibid.*, **1**, 156.
Eilenberg, M. D., Pritchard, M. J., and Whatmore, P. B. (1962). *Brit. J. prev. soc. Med.*, **16**, 22.
Mapother, E. (1929). *J. roy. san. Inst.*, **50**, 165.
Norris, V. (1959). *Mental Illness in London* (Maudsley Monographs, No. 6). Chapman and Hall, London.
Steel, R. (1960). *Lancet*, **1**, 121.

FAECAL OCCULT BLOOD AND FERROUS FUMARATE

BY

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Chronic loss of blood is the most frequent cause of iron-deficiency anaemia, and the site of bleeding is commonly located in the gastro-intestinal tract. Consequently it is important to have a simple and reliable test for the determination of occult blood in the faeces. The difficulties and fallacies in the interpretation of the chemical tests in common use have been reviewed recently by Kay (1962) and the comment made, based on reports by Illingworth (1959) and Holliday and Cuthill (1960), that ferrous fumarate medication might interfere with the tests for occult blood in the faeces. The possibility that ferrous fumarate might cause actual bleeding seemed unlikely in the light of the experimental work of Berenbaum *et al.* (1960). The claim of Illingworth made it seem unwise to prescribe ferrous fumarate for any patient where the stool might later be examined for the presence of occult blood. These criticisms of ferrous fumarate have put a considerable restraint on its use, and it seemed to us important to re-examine this problem, particularly since ferrous fumarate has been shown to be valuable in the treatment of iron-deficiency anaemia and remarkably free from toxic and side-effects (Swan and Jowett, 1959).

We will show firstly that in the patients tested ferrous fumarate given by mouth did not cause intestinal bleeding, nor did it interfere with the interpretation of the orthotolidine test for occult blood; secondly, the "hematest" and

"occultest" methods, although themselves based on the orthotolidine method, gave unreliable results, whereas the orthotolidine test proved to be an accurate and sensitive method of detecting faecal occult blood loss; finally, our results emphasize the need for careful preparation of the patient before performing any test for occult alimentary bleeding.

Materials and Methods

Selection of Patients.—In an attempt to eliminate positive faecal occult blood results due to factors other than the oral administration of ferrous fumarate, patients were selected according to the following strict criteria. All were without a history of gastro-intestinal disease and in all cases proctoscopic examination excluded the presence of haemorrhoids. An oral examination was made to exclude gingivitis or any periodontal condition likely to cause bleeding, and brushing of the teeth was prohibited during the period of study. A careful drug history was taken to exclude, in particular, the taking of aspirin or salicylates, as these have been shown to cause intestinal bleeding (Grossman *et al.*, 1961). All patients were given a meat-free diet and faecal collections were made during the stay in hospital; it was considered that collections made after the patient had returned home would provide unreliable information as the diet could not be strictly controlled.

Methods of Testing Faecal Specimens for Occult Blood.—(1) The orthotolidine test was done after the method of Kohn and O'Kelly (1955), using 4% orthotolidine. The test was read by the following criteria: blue colour developing within 15 seconds, strong positive; blue colour developing between 15 and 30 seconds, moderate positive; blue colour developing between 30 and 45 seconds, weak positive; no blue colour between 0 and 45 seconds, negative. (2) Spectroscopic examination for pyridine-haemochromogen was made after the method of Harrison (1947), using tungsten light, and read as follows: an intense black band in the green, strong positive; a grey-black band in the green, moderate positive; a faint grey band in the green, weak positive. (3) "Hematest" and "occultest" (Ames Co., London) tablets were employed, using a modification of the method of Steingold and Roberts (1961). The tests were read as described by the makers.*

Results

Effect of Ferrous Fumarate on the Orthotolidine Test for Occult Blood

Ferrous Fumarate Given by Mouth.—Ten patients were selected, as described above, and given a meat-free diet. Faecal collections were started immediately and every stool passed was saved. Days on which no specimen was obtained were recorded. After three days the patients were started on ferrous fumarate, 200 mg. thrice daily, and faecal collections were continued. One of the patients (Fig. 1, Case 10) was allowed to return to an ordinary hospital diet after seven days on the trial and was then put back on a meat-free diet after the lapse of a further 11 days. He was kept on ferrous fumarate throughout and specimens were collected until the 28th day with the exception of the 11 days during which he was on the ordinary diet. Stools from all 10 patients, when tested with orthotolidine, gave a negative result after ferrous fumarate had been taken for periods varying from 1 to 28 days.

It is worth noting that the orthotolidine test remained positive for one to four days after stopping a meat-containing

FIG. 1.—Daily results from the orthotolidine test used as described on the stools from 10 patients given ferrous fumarate from the fourth day.

*The makers recommend hematest tablets for the detection of occult blood in faeces and occultest for urine. Nothing in this communication implies any criticism of the use of occultest tablets for the detection of blood in the urine.

ing diet; Case 1, in whom the test became negative on the fifth day, had been given meat in error on the third day. Case 10, on an ordinary diet from the 7th to the 18th day, took three days to revert to his previous negative pattern. Of the total of 66 specimens tested, the first 51 were also tested by the pyridine-haemochromogen method, the results being in complete agreement with those given by the orthotolidine method.

Ferrous Fumarate Added Directly to Faeces—in vitro.—Ferrous fumarate tablets were ground with a portion of faeces previously shown to give a negative response to orthotolidine. Two dilutions were used, based on the estimated quantity of ferrous fumarate present in the faeces of patients on a dosage of 200 mg. thrice daily having their bowels open daily or once in four days. The two dilutions used were 0.5 g. in 200 g. of faeces and 2 g. in 200 g. of faeces respectively. The experiment was repeated on two separate occasions. Both dilutions gave a negative response to orthotolidine.

Comparison of the Orthotolidine Test with the Pyridine-Haemochromogen Method, Hematest, and Occultest

In a series of *in vitro* tests the orthotolidine test was assessed for reliability and sensitivity and compared with other methods of detecting faecal occult blood.

Comparison of the Orthotolidine Test and Pyridine-Haemochromogen Method on Random Stools.—In view of the reliability of the pyridine-haemochromogen test (Snapper and Van Creveld, 1927a, 1927b; Harrison, 1947) a comparison was made of the results obtained with a further 27 specimens of stool, using the orthotolidine and pyridine-haemochromogen methods. The specimens were first tested by the orthotolidine method and then, after being randomized, were tested blind by the pyridine-haemochromogen method. Fig. 2 shows there was complete agreement in all cases.

FIG. 2.—Comparison of the orthotolidine test and pyridine-haemochromogen test on 27 random stools.

Comparison of the Orthotolidine Test, Hematest, and Occultest on Serial Dilutions of Blood in Faeces.—Orthotolidine, hematest, and occultest were tested against blood diluted serially in faeces from 1 in 125 to 1 in 1,000,000. Reference to Fig. 3 shows the smooth gradation of results using orthotolidine and its sensitivity even to high dilutions of blood. The hematest and occultest tablets were found far less sensitive, and it is worthy of note that in this study the occultest was unreliable, having registered weakly

FIG. 3.—Orthotolidine test as described, hematest and occultest tablets compared, using serial dilutions of blood in faeces from 1/125 to 1/1,000,000

positive at dilution 1 in 125, negative at 1 in 250, and moderately positive in 1 in 1,000.

Comparison of the Orthotolidine Test, Hematest, and Occultest on Random Specimens of Stool.—Fifty-six specimens of stool were examined by each of three methods—the orthotolidine test, hematest tablets, and occultest tablets. Forty-five of the specimens were obtained at random from the surgical wards and the remaining 11 were aliquots of specimens from patients in the ferrous fumarate trial where the results were already known. These were added at random to provide a double check on the results of both series. Clinical correlation was not made until after the results had been recorded.

The specimens were coded and tested first by the orthotolidine method and then, after they had been recoded, by the tablet tests. The results are shown in Fig. 4.

FIG. 4.—Comparison of the orthotolidine test, hematest, and occultest on random stools.

Two significant observations emerged from this trial. Firstly, in no case did orthotolidine give a negative result in a patient with clear clinical evidence of bleeding. By contrast, negative results were obtained with the other tests in three such cases. Case 3 (haemorrhoids and carcinoma of the colon) gave a negative result with the hematest tablet; Case 34 (active stomal ulcer) and Case 35 (carcinoma of stomach) gave positive results with orthotolidine but negative results with one or both of the other tests. Secondly, all the negative results obtained with orthotolidine proved to be from patients on a strict meat-free diet, either because they were included in the trial of ferrous fumarate or because their stools were being routinely tested for occult blood; the other tests gave positive results with some of these specimens.

Discussion

In the patients tested, ferrous fumarate in therapeutic oral dosage did not cause intestinal bleeding nor did it interfere with the interpretation of the orthotolidine test or pyridine-haemochromogen test for the presence of occult blood in the stool. Again, ferrous fumarate added to faeces *in vitro* did not produce positive orthotolidine tests.

Previous reports of positive occult blood results produced by ferrous fumarate may be explained on the basis of inadequate control of diet and lack of careful selection of patients. In particular, it would seem that the results of any trial using hematest or occultest tablets as indicators are open to serious question.

Our results confirm the observations of Kay (1962) that patients suspected of alimentary bleeding should be adequately prepared before testing the faeces for occult blood. In particular, the patients must be on a strict meat-free diet for at least three days prior to faecal collections.

It is essential to take a careful drug history, particularly with regard to salicylates. After the main experiment and as a rider to it, three patients (Fig. 1, Cases 8, 9, and 10) were given aspirin 10 gr. (65 mg) thrice daily after faecal specimens had been persistently negative to orthotolidine for several days. In two, subsequent stools gave a prompt positive result. This observation not only demonstrated the now well-known tendency for salicylates to produce intestinal bleeding but showed that patients who had been on ferrous fumarate for days with negative orthotolidine results could be induced to bleed promptly with a drug known to cause bleeding.

Examination of the mouth and rectum is likewise mandatory. Patients having their own teeth must be prohibited from tooth-brushing, and any patient with a gingival condition which bleeds on simple finger-pressure should not be allowed any food which requires heavy mastication during the period of testing. A proctoscopic examination is essential. If these criteria are not fulfilled a positive result is open to question and likely to be valueless.

The extreme sensitivity of the orthotolidine test has disadvantages, but its value lies in the fact that a negative result can be regarded as very strong evidence that at the time of testing there was no occult intestinal bleeding. On the other hand, if the above criteria are fulfilled and the test remains positive then alimentary bleeding can be inferred with a high degree of certainty.

Spectroscopic analysis for pyridine-haemochromogen is a reliable method of testing for faecal occult blood; but it is tedious, and some experience is needed in its interpretation. If desired it can be used for confirmation of orthotolidine results, as the results of the two methods agree very closely.

Summary

In 10 patients tested ferrous fumarate did not cause intestinal bleeding or interfere with the orthotolidine test for faecal occult blood.

The orthotolidine test would seem to be a reliable and sensitive method of testing for faecal occult blood loss and agreed exactly with the spectroscopic pyridine-haemochromogen method. Hematest and occultest tablets gave unreliable evidence of the presence or absence of blood in the stool.

The results obtained confirm the necessity for careful preparation and examination of the patient prior to carrying out tests for occult intestinal bleeding.

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REFERENCES

- Berenbaum, M. C., Child, K. J., Davis, B., Sharpe, H. M., and Tomich, E. G. (1960). *Blood*, 15, 540.
- Grossman, M. I., Matsumoto, K. K., and Lichter, R. J. (1961). *Gastroenterology*, 40, 383.
- Harrison, G. A. (1947). *Chemical Methods in Clinical Medicine*, 3rd ed., p. 501. Churchill, London.
- Holliday, T. D. S., and Cuthill, I. M. (1960). *Brit. med. J.*, 2, 1310.
- Illingworth, D. G. (1959). *Ibid.*, 2, 1099.
- Kay, A. W. (1962). *Ibid.*, 1, 1709.
- Kohn, J., and O Kelly, T. (1955). *J. clin. Path.*, 8, 249.
- Snapper, I., and Van Creveld, S. (1927a). *Ergebn. inn. Med. Kinderheilk.*, 32, 1.
- (1927b). *Med. T. Geneesk.*, 2, 401, 525.
- Steingold, L., and Roberts, A. A. (1961). *Gut*, 2, 75.
- Swan, H. T., and Jowett, G. H. (1959). *Brit. med. J.*, 2, 782.