

Occlusion of the posterior tibial artery is the commonest lesion and isolated anterior tibial and combined anterior and posterior tibial occlusions are also common. The peroneal artery is rarely occluded as the sole lower-leg lesion.

The incidence of lower-leg occlusion is high (45.6%) and rises steeply with increasing age.

I wish to express my grateful thanks to my colleagues, Mr. W. Reid and Mr. T. G. Gray, for permission to include their patients in this survey, and to Dr. D. Raeside for the skill that made it

possible to obtain the excellent arteriograms on which this article is based.

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Haemoglobin Estimation: a Comparison of Different Techniques

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This trial was undertaken to try to assess the relative usefulness of different types of apparatus recommended for haemoglobin estimation. With the exception of the E.E.L. colorimeter all the equipment used was specifically designed for haemoglobinometry. The errors of four observers of varied experience were examined by means of seven different techniques, and the consistency of their errors was assessed at different haemoglobin levels. In addition, the general convenience and acceptability of each method was noted.

Recent statements (*Brit. med. J.*, 1965), made with no supporting evidence, have condemned the use of whole-blood methods of haemoglobinometry and instruments employing visual matching. The present trial shows that such general statements are not fully justified and that a method in which whole blood is used may be fully adequate for some purposes and compare well with a method using a photoelectric colorimeter. The Tallqvist method was included in this investigation only because it is known to be still used by some doctors. The results it gave were too erratic for analysis.

Types of Apparatus Used in the Trial

E.E.L. Haemoglobin Meter (made and distributed by Evans Electro-selenium Ltd.).—Diluted blood in a matched colorimeter tube is placed in the instrument. Transmitted green light from a mains-lit bulb is measured photoelectrically. The haemoglobin concentration is indicated by the deflection of a galvanometer as g./100 ml. of blood or as percentage haemoglobin (based on 100% = 14.6 g. Hb). Oxyhaemoglobin or cyanmethaemoglobin can be estimated. For either estimation two standards are required—one high (18 g./100 ml.) and one low (3 g./100 ml.)—and, while these can be obtained ready for use with the cyanmethaemoglobin method, they have to be freshly prepared each day for the oxyhaemoglobin method. For preparation of the oxyhaemoglobin standards lysed whole-blood standards are available with a table giving the required dilutions (stated to the nearest 0.05 ml.). The instrument is slow to stabilize when switched on (15 minutes is recommended) but appears to be very stable thereafter. Standardization is tedious for the oxyhaemoglobin method, and during the preparation of the standards considerable errors may occur. The instrument is very convenient to use, particularly as it is direct-

reading. It is not readily portable, and diluting fluid, pipettes, and standards are required for its use.

E.E.L. Colorimeter (made and distributed by Evans Electro-selenium Ltd.).—Diluted blood is placed in a matched colorimeter tube. Transmitted green light from a mains-lit bulb is measured photoelectrically and read on a galvanometer in arbitrary units. The zero is set on a tube filled with diluent, and any haemoglobin derivative (oxyhaemoglobin, cyanmethaemoglobin, etc.) can be estimated, provided a calibration curve is prepared with serial dilution of a standard blood of known haemoglobin level. The initial calibration is tedious, but otherwise the instrument is easy to use. It requires very frequent readjustments of the zero, but this is very simply done. It also requires regular checking of the calibration curve with a blood of known haemoglobin level. Occasional recalibration may be necessary. It is not easily portable, and diluting fluid and pipettes are required for its use.

Keeler Haemoscope (made and distributed by C. Davis Keeler Ltd.).—This instrument is a development of the M.R.C. grey-wedge photometer and it was tested in prototype form. A diluted sample of blood is placed in a square cell. The intensity of transmitted green light from a battery-lit bulb is viewed through an eyepiece and compared on a split screen with that of a variable standard. Haemoglobin levels are given in g./100 ml. of blood. There are separate scales for oxyhaemoglobin and cyanmethaemoglobin. A neutral glass standard is supplied with the instrument, and any difference between its nominal and estimated value can be used to correct subsequent readings. This instrument is quick and simple to use, but matching of the sample and standard is not easy. The use of the neutral glass standard to correct readings seems to be of doubtful value. It is robustly made and well finished, and is easily portable, but diluting fluid and pipettes are required.

Zeiss Hämometer (this instrument was made by Zeiss but is no longer available).—Blood is diluted with 0.1N hydrochloric acid in a special mixing pipette and placed in a square colorimeter tube. Five minutes after mixing the colour density of the sample in reflected daylight is viewed through an eyepiece and matched with that of a variable standard seen on a split screen. The colour intensity of the standard is varied, and when matched with the sample indicates haemoglobin concentration in g./100 ml. of blood. This instrument is quite convenient to use; but it is slow, and matching of the sample and standard is difficult. No method of standardization is supplied. It is easily portable, but diluting fluid is required.

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Dare Haemoglobinometer (made and distributed by Hawksley & Sons Ltd.).—A small glass chamber is filled by capillary attraction with a drop of whole blood. The colour density of the blood, seen in the light of a battery-lit bulb, is matched with that of a variable standard viewed through an eyepiece. Haemoglobin concentration is given as g./100 ml. of blood. This instrument is very quick and convenient in use, and is easily portable. Matching the sample with the standard is not easy. No method of standardization is supplied.

A. O. Spencer Haemoglobin Meter (made by the American Optical Co. and supplied by A. R. Horwell Ltd.).—A drop of whole blood is placed on one-half of a glass chamber and agitated with a small stick coated with saponin. The chamber is completed by a cover-glass held firmly by a clip and inserted into a slot in the instrument. Transmitted green light from a battery-lit bulb is compared with a variable standard on a split screen. Haemoglobin level is read as g./100 ml. of blood. This instrument is very quick and convenient in use, and matching of the sample and standard is relatively easy. No method of standardization is supplied. It is easily portable.

Hawksley Haemoglobin Scale (Tallqvist) (supplied by Hawksley & Sons Ltd.).—A drop of unmodified whole blood is placed on a strip of blotting-paper, and the colour of the drop when dry is compared with a range of standards graduated in % Hb in intervals of 10%. This method is very quick and is easy to use, but matching of the sample and standards is extremely difficult. A pocket-size book contains enough paper for at least 150 tests.

Method

Four observers—two with considerable recent experience in haemoglobinometry (O1 and O2), one with some experience several years prior to the trial but no recent experience (O3), and one with no previous experience (O4)—were asked to become familiar with each of the methods investigated during the few days before the trial began.

Four 20-ml. samples of heparinized blood with haemoglobin concentrations between 6 and 14 g./100 ml. of blood were obtained, and unknown to the observers each sample was divided into two. The resulting eight samples were lettered at random. Each observer in turn made one estimation of the haemoglobin level of each sample by each method, the order of the samples and methods being random. Five days later this complete series of observations was repeated.

Haemoglobin concentration was estimated as oxyhaemoglobin in all instances except the Härometer, in which only acid haematin can be measured. Estimations were made on each instrument as recommended by the makers, and the instructions given were followed as closely as possible. For the Härometer special mixing pipettes are used, and these are rinsed in 0.1 N HCl between estimations, but were not dried as recommended, as this proved to be very slow and tedious. Colorimeter tubes were emptied, shaken, and all excess fluid was removed with a clean tissue after each estimation. Two instruments required standardization, and this was done according to the makers' instructions by one of the most experienced observers on each morning of the trial. The standards prepared for this were used to check these two instruments again before use by each observer. A neutral glass standard is supplied with the Haemoscope to enable a correction factor to be derived. A large number of tests with different observers showed that a wide variety of correction factors could be derived by a single observer, and these varied from day to day. It was therefore decided not to use correction factors for this instrument in the analysis, but to show overall means of all estimations of each blood sample, with and without correction, by a factor based on 10 separate observations of the standard by each observer.

During the first series of observations the time taken by each observer to make each estimation was measured. On completion of the trial each observer was asked to rank the methods in order of preference, taking into account general convenience and acceptability, but without regard to accuracy. In this assessment the standardization of the instruments used in certain methods was ignored.

Results

In the investigation estimations were made by four observers on each of the four blood samples by each of the seven methods. Table I shows the means of these estimations. The Härometer gave results which were on average about 1 g./100 ml. higher than any other method, though some of this difference is undoubtedly due to the difference between the total haemoglobin (estimated as acid haematin by this method) and oxyhaemoglobin estimated by the other six methods (Ammundsen, 1941). The Haemoscope gave results which were on average about 0.7 g./100 ml. lower than any other method, and the use of the correction factors in this method increased this difference. (This is stated by the manufacturers to have been due to an incorrectly marked standard.) The means of the estimates obtained by the Tallqvist method differed so greatly from all other methods, and inspection of the original results showed that the individual observers were so inconsistent in their estimations, that these data were omitted from the further analysis.

TABLE I.—Mean Haemoglobin Levels (as g./100 ml.) of Four Samples of Blood Estimated on the Seven Instruments (Each Based on 16 Estimations)

Instrument	Blood Sample				
	A	B	C	D	All
E.E.L. Hb meter	13.15	9.56	9.80	6.19	9.68
E.E.L. Colorimeter	13.98	10.17	10.42	6.25	10.20
Haemoscope (1)*	12.65	9.06	9.18	5.44	9.08
Haemoscope (2)*	12.72	9.13	9.26	5.51	9.15
Härometer†	15.01	10.95	11.08	6.76	10.95
Dare	13.29	9.71	9.43	5.76	9.55
A. O. Hb meter	12.90	9.65	9.65	6.36	9.64
Tallqvist‡	10.07	8.98	7.96	8.67	8.92

* (1) With correction factors; (2) Without correction factors.
 † Estimates total haemoglobin.
 ‡ Assuming that 100% = 14.6 g.

Comparisons of overall means are of limited interest as they ignore inconsistencies. The main sources of variation examined in this trial are due to the four samples of blood, the seven methods, the four observers, and the two series of observations. The consistency of the variation from these four main factors can be examined by their six first-order and four second-order interactions, and as each blood sample was replicated throughout the one third-order interaction can be examined.

After omission of the results obtained by the Tallqvist method there are 384 estimations for analysis, 64 by each of the six methods. An overall analysis of variance showed that many of the interactions of the main factors are significant (at $P < 0.05$, the criterion of significance used throughout), in particular those involving the methods and those involving the observers. In view of these inconsistencies, separate analyses of variance were done at each level of the main factors of greatest interest (instruments and observers) as indicated in what follows, and the tests of the significance of differences between means have been based on the appropriate residual variances in these analyses.

Difference Between Methods

Table II summarizes the analysis of variance of the 64 estimations by each method. The basic "errors" of the various methods can be estimated by the residual variances, as these measure the variation in each method, which is independent

of that from the main sources of variation considered (blood samples, observers, etc.), and their interactions. Further examination indicated that the residual variance of the E.E.L. colorimeter is smaller but homogenous with that of the E.E.L. haemoglobin meter, which in turn is smaller but homogenous with that of the A.O. Haemoglobin meter. However, each of these is significantly smaller than that of the Haemoscope, the Hämometer, and the Dare, each of which, in that order, increases significantly in size.

TABLE II.—*Summary of the Analyses of Variance of the 64 Haemoglobin Estimations Obtained by Each Method*

Source of Variation	D.F.	Mean Square, as (g.Hb) ² for Each Method					
		E.E.L. Hb Meter	E.E.L. Colorimeter	Haemoscope	Hämometer	Dare	A.O. Hb meter
Blood samples (B)	3	129.20*	159.73*	138.79*	181.91*	151.21*	113.97*
Observers (O)	3	0.28*	1.10*	0.23	0.93*	0.44	0.09
Days (D)	1	0.00	0.00	0.00	6.43*	0.60	0.16
B × O	9	0.06	0.18*	0.14	0.31	1.46*	0.06
B × D	3	0.04	0.12*	0.19	0.04	0.48	0.04
O × D	3	0.06	0.11*	0.40	1.95*	1.97*	0.49*
B × O × D	9	0.09	0.12*	0.11	0.15	0.32	0.08
Residual	32	0.05	0.04	0.17	0.31	0.50	0.06
Total	63	6.22	7.73	6.77	9.13	7.86	5.51

* Significant at $P < 0.05$.

The significant differences in the residual variances of the results of each method must be taken into account in what follows, as they imply that the investigation is much more "sensitive" for some methods (particularly the two photoelectric colorimeters and the A.O. Haemoglobin meter) than for others (particularly the Hämometer and the Dare). Therefore, while some very small and clinically unimportant variations in the former methods may be detected here as statistically significant, some large and clinically important variations in other methods may not be shown as statistically significant, simply because of the difference in the relative sizes of this "unexplained" variation in the different methods.

Table II shows that there were no significant inconsistencies in the results of the Haemoscope nor in those of the E.E.L. Haemoglobin meter. However, in using the E.E.L. Haemoglobin meter the differences between the observers showed significant inconsistencies on the two days, and this appears to be largely because O4 read slightly but significantly higher on the second day than on the first, though the difference was consistent for each blood sample. The Dare showed two sources of significant inconsistencies. The differences between estimations made by the four observers were not consistent for each blood sample, and the overall differences between the observers were not consistent on the two days. No single observer seems to have been responsible for the former inconsistency, but the latter appears to have been caused largely by O4, whose estimates on the second day were on average lower than on the first day, while the reverse trend occurred with the other three observers.

In the Hämometer the differences between observers were not consistent in the two days, and this appears to have been due to two of the observers (O2 and O4) having read, on average, over 1 g./100 ml. higher on the second day than on the first, while the other two observers showed almost no overall change on the two days. The E.E.L. Colorimeter showed many inconsistencies, as the differences between the mean estimates of the four observers on each sample obtained on the two days showed significant heterogeneity. This is probably a reflection of the very small residual variance in this method (Table II), though a further analysis of the data did indicate that O4 was largely responsible for the inconsistencies, and omission of the results of this observer removes almost all the significant inconsistencies in the data for this method. It is of relevance that the observers who had had previous experience (O1, O2, and O3) had all been much more familiar with this method than with any of the other methods investigated.

It seems reasonable to conclude, therefore, that, though there are many inconsistencies in the data, these could well be due to chance in the E.E.L. Haemoglobin meter and the Hämoscope, and though the inconsistencies in the E.E.L. Colorimeter and the A.O. Haemoglobin meter are significant they are small and unlikely to be important in clinical practice. In fact, though none of the inconsistencies in the Haemoscope are significant, they are larger than those of the two colorimeters and the A.O. Haemoglobin meter. The inconsistencies of the Hämometer and the Dare are relatively large, and are likely to be of importance clinically, while the Tallqvist gave results in this trial which appear to be of little clinical value.

Effect of Observer

If skill in haemoglobinometry is important in the instruments investigated here, then one would expect that the two observers with recent experience (O1 and O2) would consistently show smaller residual variances in the analysis of the variance of the results for each method than the observer with experience several years prior to the trial (O3), who in turn should show a smaller residual variance than the observer with no previous experience (O4). Furthermore, it is reasonable to expect that the skill so measured should be more apparent in the methods which require very exact dilution of blood than in those in which whole blood is used. Only the E.E.L. Colorimeter showed the expected pattern, possibly because the experienced observers were familiar with this machine. In the other methods which necessitate dilution of blood (E.E.L. Haemoglobin meter, Haemoscope, and Hämometer) one of the most experienced observers (O1) had the smallest residual variance, but no consistent trend was shown by the other three observers, and in fact the second most experienced observer (O2) appears to have shown the worst overall performance in these methods if judged by this criterion. In the whole-blood methods (the Dare and the A.O. Haemoglobin meter) there is almost complete disagreement in the order of the observers when ranked by the sizes of their residual variances, suggesting that previous experience in haemoglobinometry may be of little importance in these methods.

There is therefore some limited evidence in these data that in methods of haemoglobinometry in which a sample of blood is diluted experience may be a factor of relevance, though it does not appear to be the only factor of importance which relates to the observer. In the methods in which the estimation is made on the whole blood there is no evidence to suggest that experience of the observer is of importance. None of the observers were, however, experienced with this type of technique.

Speed and Convenience of Methods

The average time taken for a single estimation by each method is shown in Table III. The differences in the times for a single estimation are small and unlikely to be important, except for the Hämometer, which was much slower than any other method.

TABLE III.—*Mean Time Taken by Four Observers to Make a Single Haemoglobin Estimation on Each of the Seven Instruments, the Estimated Time Required for Standardization, and the Mean Rank Allotted to Each Method by the Four Observers on the Basis of Convenience and Acceptability*

Instrument	Mean Time for One Estimation	Estimated Time for Standardization (see text)	Mean Rank
E.E.L. Hb meter	1 min. 34 sec.	4 min.	1
E.E.L. Colorimeter	1 min. 46 sec.	2 min.*	3
Haemoscope	2 min. 00 sec.	30 sec.	2
Hämometer	5 min. 49 sec.	—	5
Dare	1 min. 58 sec.	—	6
A.O. Hb. meter	2 min. 02 sec.	—	4
Tallqvist	2 min. 02 sec.	—	7

* Calibration also required occasionally (see text).

There was significant concordance between the orders of the methods when ranked by each observer ($P < 0.001$), so these have been pooled to obtain a mean ranking (Table III). Judged by convenience and general acceptability, and with no regard to accuracy, the E.E.L. Haemoglobin meter and the Hämoscope were superior to the E.E.L. Colorimeter and the A.O. Haemoglobin meter; Hämometer, Dare, and Tallqvist were judged least acceptable. In these assessments no account has been taken of the necessary frequent standardization of the colorimeters and the occasional calibration of the E.E.L. Haemoglobin meter, and it must be remembered that these times and judgments relate to four laboratory technicians, three of whom were well practised in pipetting fluids.

Further Test of the E.E.L. Colorimeter and A.O. Haemoglobin Meter

In the trial the A.O. Haemoglobin meter gave results which, though not as good as those of the two photoelectric instruments, were better than obtained by any other method investigated. As this instrument appears to us to be particularly well suited for use in survey work and in general practice, it was decided to investigate it further.

Over a period of about three months two A.O. Haemoglobin meters were used in a hospital laboratory and compared with

an E.E.L. Colorimeter by means of the cyanmethaemoglobin method and an approved standard. One or other of two trained technicians made haemoglobin estimations in duplicate on one of the A.O. Haemoglobin meters and the E.E.L. Colorimeter. Each A.O. Haemoglobin meter was so used for 100 blood samples with a range of levels between 4.4 and 17.9 g.

Both technicians liked the A.O. Haemoglobin meters; they found them easy to use. No faults developed during the three months, and there was no evidence that prolonged use of the batteries caused any decrease in accuracy or any increased difficulty in matching. Figs. 1 and 2 show graphically the means of the 100 duplicate estimations on each of the two A.O. Haemoglobin meters and the corresponding duplicate estimation on the E.E.L. Colorimeter. The consistency of each instrument can best be examined by comparison of the variances after the component due to differences between samples has been removed (Table IV). It appears that the consistency of the E.E.L. Colorimeter is significantly better than that of either A.O. Haemoglobin meter, but the standard error of a single estimate on either of the A.O. Haemoglobin meters (0.22 and 0.25 g./100 ml.) does not differ very greatly from that of a single estimate on the E.E.L. (0.16 g./100 ml.). The haemoglobin values obtained with both the A.O. Haemoglobin meters were higher than the E.E.L. results, which were standardized against a commercially prepared cyanmethaemoglobin solution (C. Davis Keeler Ltd.). The mean differences were 1.63 and 0.77 g./100 ml. respectively for the two A.O. machines, and for routine use a corresponding correction would have to be made. The difference appears to be constant for a particular machine. In the original machine the A.O. results were slightly lower than those of the E.E.L. Colorimeter.

TABLE IV.—*Variances of 100 Haemoglobin Estimations on Two A.O. Haemoglobin Meters, and, for the Same Blood Samples in Each Case, an E.E.L. Colorimeter*

Instruments	Variance*	Variance Ratio
A.O. Hb meter (1)	0.0493	2.00 P < 0.01
E.E.L. Colorimeter	0.0247	
A.O. Hb. meter (2)	0.0637	2.51 P < 0.01
E.E.L. Colorimeter	0.0253	

* Based on replications alone (see text).

This further investigation confirms the results of the main study. In the hands of skilled technicians the results of the E.E.L. Colorimeter were better than those of the A.O. Haemoglobin meter. However, this difference is likely to be much smaller with less-skilled workers, and because of its portability and convenience the A.O. Haemoglobin meter would appear to be a most suitable instrument for use in survey work and in general practice.

Discussion

The error in a haemoglobin estimation on a sample of blood may be inherent in the method of estimation or be caused by the observer who makes the estimation. In the estimation of the haemoglobin level of a subject errors from one or both of these sources may be important, but sources of physiological variation in haemoglobin level "within the subject" must also be considered, as these may be of greater relative importance than errors due to the method of estimation or those caused by the observer.

The present study shows that the basic errors in methods of haemoglobinometry vary considerably, and suggests that in certain methods these errors may be smaller with a skilled observer. The effect of skill is less apparent with methods in which the estimation is made directly on a sample of whole blood.

The use of whole blood in haemoglobinometry is difficult, owing to the relatively high colour density and opacity of unmodified blood. However, it seems that these disadvantages

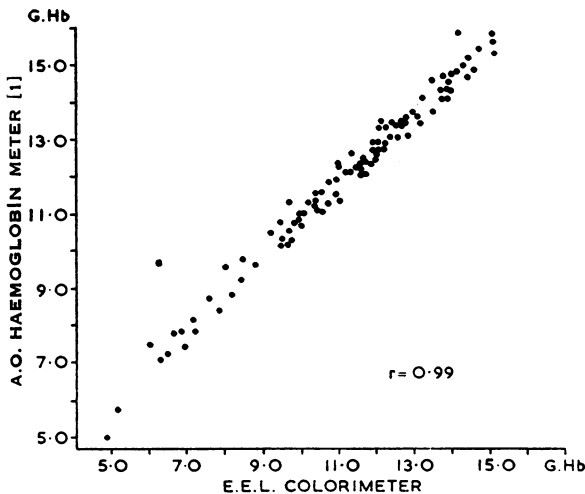


FIG. 1.—Mean haemoglobin levels (as g. Hb/100 ml. blood) based on duplicate estimations made on an A.O. Haemoglobin meter and an E.E.L. Colorimeter.

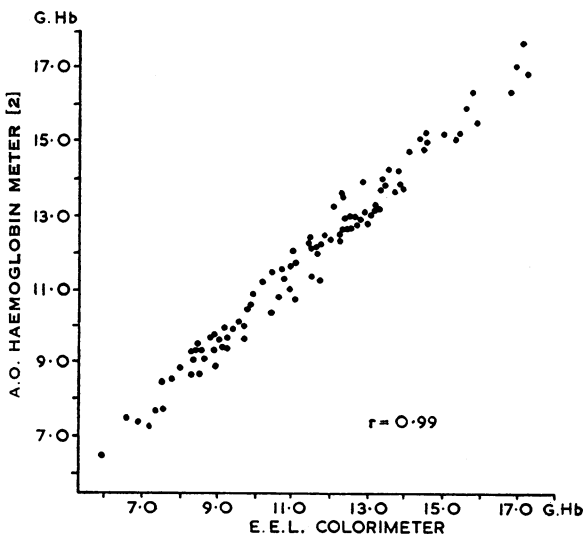


FIG. 2.—Mean haemoglobin levels (as g. Hb/100 ml. blood) based on duplicate estimations made on an A.O. Haemoglobin meter and an E.E.L. Colorimeter.

can be overcome to a very large extent by haemolysis. The further testing of the A.O. Haemoglobin meter indicates that this is an extremely useful instrument, and though not as consistent as the two photoelectric instruments the difference is small, and is likely to be very small indeed with less-practised observers than the two involved in the present study.

The number of different methods of haemoglobinometry is so large that it was virtually impossible to compare more than a few at any one time. However, a fairly wide variety of types of method were represented, and the results would seem to support the following general conclusions. In a laboratory in which a large number of blood samples are handled and the observers are relatively skilled, a method based on a photoelectric colorimeter appears to be preferable to the other types of method investigated here. Under such conditions the time required for standardization and, if necessary, calibration of an instrument is small relative to the time it is in use. On the other hand, experience with the A.O. Haemoglobin meter shows that it is possible for a single whole-blood method to provide adequate results for the relatively unskilled observer who wishes to make an occasional haemoglobin estimation. It is also a suitable technique for field surveys where the more cumbersome instruments are impracticable.

Summary

Four laboratory technicians, with varied experience in haemoglobinometry, estimated the haemoglobin levels of replicated samples of four specimens of blood on two days, with seven different methods.

Two methods based on the use of photoelectric colorimeters gave the most consistent results, but one of the methods in which lysed whole blood is compared visually with a standard gave results which were almost as consistent, and which were better than those of any of the other methods. Skill in haemoglobinometry appeared to be of some importance in methods requiring dilution of fluids but of less importance in methods using whole blood.

A further limited examination of two of the methods (the E.E.L. Colorimeter and the A.O. Haemoglobin meter) over a period of three months in routine laboratory work confirmed that the E.E.L. Colorimeter gave more consistent results than the A.O. Haemoglobin meter, though the difference was small and the correlation between the two was extremely high ($r=0.99$).

For routine haemoglobinometry in skilled and practised hands a photoelectric colorimetric method is therefore recommended, but for survey work and use in general practice, and particularly for occasional use, the A.O. Haemoglobin meter, in which the estimation is made on whole blood, is adequate and probably preferable to any of the other methods investigated.

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Control of Infection after Prostatectomy

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It is always difficult to avoid infection after prostatectomy. Some surgeons believe it to be almost inevitable (Farquharson, 1962). For some time it had been almost invariably occurring in a surgical ward, and especially disturbing was the high incidence of infection by *Pseudomonas pyocyanea*. It is generally agreed that this is the result of cross-infection and as such largely preventable. In fact the incidence of infection by these bacteria could be regarded as an index of cross-infection in urological surgery. To deal with this problem an effort was made to reduce the infection rate by three measures: immediate or early prostatectomy in cases of acute retention of urine; the introduction of a new closed system of urine drainage; and the administration of the osmotic diuretic mannitol in the immediate post-operative period.

Material and Methods

The series includes all cases of prostatectomy performed in a general surgical ward, without special interest in urology, during the two years from September 1962 to September 1964.

During the first year the management of patients with prostatic obstruction was as follows. Those admitted with acute retention of urine were catheterized soon after admission and the catheter was connected by means of a sterile piece of rubber tube to a King's College Hospital drainage-bottle.

Continuous bladder-drainage was applied until the next "cold" operating session, which usually took place two to five days, sometimes longer, after admission, when retropubic prostatectomy was performed. After the operation the same type of drainage was continued. Bladder wash-outs were carried out every two hours or as often as necessary until no clots were present in the urine. Nitrofurantoin (Furadantin) or a combination of penicillin and streptomycin was given for five days post-operatively. During the operation intravenous dextrose 5% in water was administered and about one-third of the patients had blood transfusion. The catheter was usually removed four or five days after the operation. The management of cases admitted for elective prostatectomy was the same except that no catheter was passed before the operation.

The following modified regime was adopted in September 1963 and continued for the next year. Patients with acute retention of urine underwent retropubic prostatectomy within four hours of admission whenever possible. During the operation 2 pints (1,080 ml.) of intravenous dextrose 5% in water was given except in one-third of the patients, who had a transfusion of 1 pint (540 ml.) of blood instead of the same volume of the dextrose 5% solution. At the end of the operation the indwelling catheter was connected to a sterile Aldington type "C" bag of 1,500 ml. capacity (see Fig. 1).¹ This bag is made

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¹ Manufactured by Aldington Laboratories Ltd., Aldington Frith, Mersham, Ashford, Kent.