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Comparison of peak flow gauge and peak flow meter

A. BHOOMKAR, SYLVIA DAVIES, MARION GEARY, and ELIZABETH A. HILLS

Tindal General Hospital and Respiratory Laboratory, Stoke Mandeville Hospital

Bhoomkar, A., Davies, Sylvia, Geary, M., and Hills, Elizabeth A. (1975). *Thorax*, **30**, 225–227. **Comparison of peak flow gauge and peak flow meter.** A comparison has been made of the new peak flow gauge and the Wright peak flow meter. Close correlation was found between measurements made with the two instruments both in normal subjects and in patients. The peak flow gauge is as consistent as the peak flow meter but is cheaper and more portable. It should be useful in survey work in general practice and for loan from hospital outpatient departments where serial measurements are used to monitor patients' progress.

Wright and McKerrow described the peak flow meter in 1959. Since that time the instrument has been used widely and has been found reliable over long periods. It is frequently used in hospitals and general practice as it provides the cheapest method of measuring change in patients' ventilatory function whether spontaneously or as the result of provocation tests or therapy. The Wright peak flow meter depends upon the rotation of a vane attached to a spiral spring (Wright and McKerrow, 1959). Movement of the vane uncovers an annular orifice, and the point at which pressure behind the vane balances the force of the spring depends upon the flow rate. The peak flow gauge is a straight cylinder. The forced expiration moves a piston plate down the cylinder, exposing an exhaust slot. The point at which flow through the exhaust slot is balanced by a tension spring attached to the piston plate represents the subject's peak flow rate, and as the piston plate is caught by a ratchet the point is marked on a linear scale.

The two instruments were compared in measuring expiratory peak flow rates in subjects with normal or abnormal respiratory function.

SUBJECTS AND METHODS

Subjects studied were patients attending outpatient clinics (the majority suffering from respiratory disease), hospital staff or passers-by in the corridor outside the respiratory laboratory. By recording age, sex, and height and limiting observations to Caucasians, a normal value for peak expiratory flow rate (PEFR) was predicted from regression lines published by Cotes (1968). Alternate subjects used the meter or gauge first. Patients were usually practised blowers and produced three consistent blows when asked, but untrained subjects were allowed two or more practice blows until a steady level was achieved, and three similar readings were recorded. The mean of these three values was used in calculations. Measurements were made with patients standing unless they were unable to do so. The position of the gauge was observed carefully and corrected to the horizontal if necessary as deviations of a few degrees upwards will decrease, and downwards will increase, the reading.

In addition, serial measurements were made in patients admitted for treatment of respiratory failure or bronchial asthma. Each patient blew three times into each instrument thrice daily using meter or gauge first on each occasion.

RESULTS

One hundred and ninety-five subjects were studied on a single occasion. For one male patient height was not recorded and predicted normal is unknown. Fifty subjects had peak flow rates within 10% predicted normal; 145 were below 90% predicted normal; 100 blew first into the gauge, and 95 first into the meter.

It was found that some normal subjects were able to produce a falsely high PEFR reading on the gauge by a certain quick, puffing manoeuvre but this was never found with patients with abnormal lung function. The scatter diagram (Fig. 1)

shows that there is good agreement between the old and new instruments. The regression coefficient was calculated taking peak flow gauge reading as the dependent variable. The product moment correlation is 0·97, which is highly significant. The regression coefficient is 0·92 (SE 0·018). The correlation for normal subjects is +0·94, and for abnormal subjects +0·95. For subjects using the peak flow gauge first it is +0·96 and for subjects using the meter first +0·96.

Figure 2 shows the relationship between serial

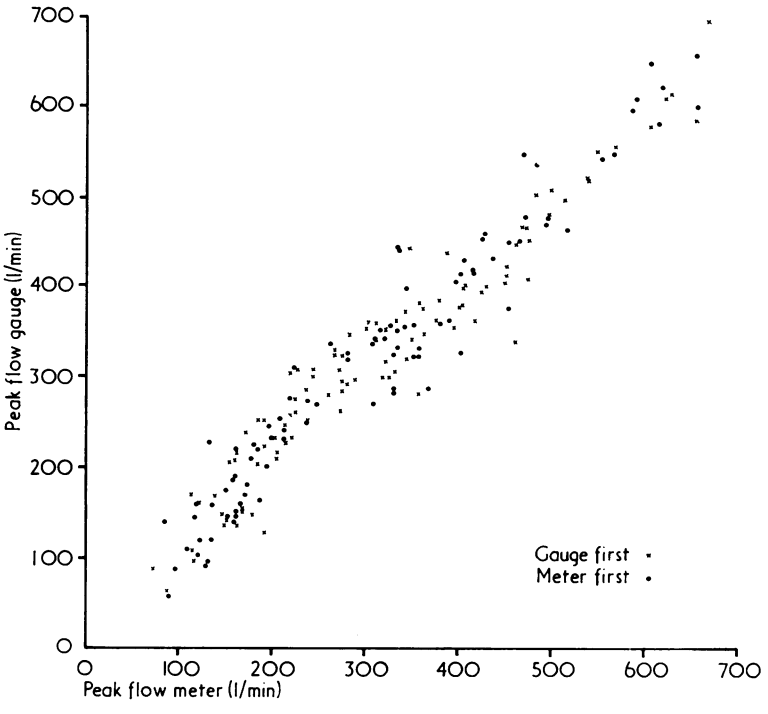

FIG. 1. *Scattergram of readings on the peak flow meter and peak flow gauge.*

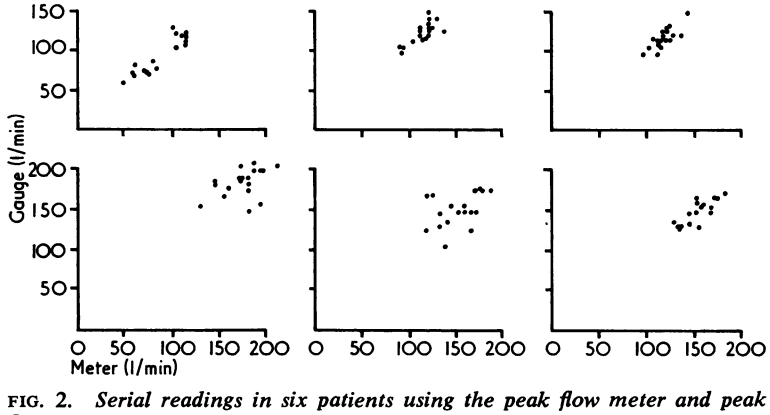

FIG. 2. *Serial readings in six patients using the peak flow meter and peak flow gauge.*

measurements using the two instruments in patients in hospital. In any one patient there is no consistent tendency for the patient to produce a higher reading on one machine, so that the scatter of the readings is not due to the tendency of asthmatic patients to produce progressively lower peak flows. In general, the instruments appear equally efficient when demonstrating improvement or deterioration in PEFR.

CONCLUSIONS

The new peak flow gauge produces readings for PEFR which correlate closely with readings recorded on the peak flow meter. The new instrument has the advantage of light weight and low cost, although it requires more care in operation as it is subject to variation due to angulation of the instrument and is sensitive to a very quick hard puff which produces high readings. Providing the use of the instrument is carefully demonstrated to the patient, it should be useful for studying changes in patients' lung function because, due to its low cost and small weight, it is suitable for loan to patients to record variation in lung function in their home or work environment.

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Requests for reprints to: Dr. Elizabeth A. Hills, Respiratory Laboratory, Stoke Mandeville Hospital, Aylesbury, Bucks.