Improving nutritional screening through an audit on accuracy and reliability of weighing scales and stadiometers

W. Stanley, H. Warwick, R.J Stratton, M. Elia
Southampton University and Southampton University Hospitals NHS Trust

Background

As malnutrition in hospital is common (15-60% of patients) but often unrecognised and untreated, routine screening is recommended. The correct identification of malnourished patients depends on the accuracy and reliability (reproducibility) of weighing scales and stadiometers. In many hospitals a wide range of such instruments are used, only some of which are appropriately calibrated.

Aims

To examine: (i) the availability, accuracy and reproducibility of weighing scales and stadiometers in 47 in-patient wards in Southampton General Hospital (ii) the extent to which weighing scales conform to the UK Weighing Federation recommendations (accurate to within 0.2kg), and (iii) the effects of inaccurate instruments on nutritional screening.

Methods

Audit trail: The accuracy of stadiometers was assessed using two stainless steel rods: 6 feet (182.88cm) and 4 feet (121.92cm) certificated by Trading Standards County Council - linked to the National Weight and Standards Laboratory. A standard reference weight of 60.8kg was obtained from the local Equipment Laboratory to test the accuracy of weighing scales.
Measurements: Duplicate measurements were made on the instruments using the above reference standards as well as two subjects who followed standard measurement procedures (one for weight the other for height). Weighing scales were zeroed before measurements were taken.
The audit was undertaken in September 2006 and involved co-operation between Wards, Supplies Department, and the Equipment/ Maintenance Library.

Results

Of 113 weighing scales, 85 (75%) were electronic and 28 (25%) were manual. Fourteen of these scales were broken and unusable. During the previous year, 87 (77%) of the weighing scales and none of the stadiometers (n=28) had been calibrated.
Reproducibility: The precision of the instruments was very good (coefficient of variation $\leq$ 0.5%), irrespective of whether this was based on duplicate measurements of standard or individual subject weight and lengths/height.
Accuracy
The Figure shows the weights recorded by the weighing scales when the standard weight (60.8 kg) was used. For the manual scales, the measured values deviated from the standard weight by -6.3kg (- 10.4% of actual weight) to +2.7kg (4.4% of actual weight) (mean -0.83 $\pm$ 1.68 (sd) kg), and for the electronic scales from -0.5kg (-0.8% of actual weight) to 0.7kg (1.2% of actual weight) (mean 0.02 $\pm$ 0.16 (sd) kg). For a height of 1.70m this translates to a measurement error in BMI ranging from -2.2 to + 0.9kg/m^2 for manual scales, and from - 0.17 to + 0.24kg/m^2 for electronic scales. 68%

of the manual scales were in error by more than 0.2 kg compared to 11% of the electronic scales. Some manual scales were inaccurate even when calibrated in the previous year (Figure).

With the exception of one stadiometer which underestimated reference length by 2.78 cm, the remaining stadiometers (n=27) provided measurements that deviated from the reference 6 foot rod (182.88cm) by -0.38cm to + 0.72cm (mean 0.02 $\pm$ 0.24 (sd) cm) and from the 4 foot rod (121.92cm) by -0.22cm to +0.58cm (mean 0.09 $\pm$ 0.21 (sd) cm). For a weight of 60.8kg and height of 1.83m this translates to an error in BMI ranging from + 0.57kg/m^2 to – 0.14kg/m^2 respectively (from +0.08 to -0.14kg/m^2 when the stadiometer which underestimated reference length by 2.78cm was excluded).

Action

- Manual weighing scales and the stadiometer that read incorrectly by 2.78cm were removed from wards, all of which had access to accurate instruments.
- Wards were encouraged to continue obtaining more stadiometers (9 available in 2002; 15 in 2004) and purchase scales that met the UK Weighing Federation recommendation.
- A procedure is in place to ensure that appropriate clinical scales are purchased, maintained and distributed to wards.
- A plan to continue to re-audit was established to ensure sustained use of accurate and reliable instruments

Impact

This audit has:

- improved the accuracy of nutritional screening.
- multidisciplinary impact, affecting all types of wards, which may share equipment, and all types of patients, including those transferring from one ward to another.
- relevance to the use of weight and height for other purposes, such as assessment of drug dosage (e.g. for chemotherapy) and fluid balance (daily changes).

There were no obvious barriers to undertaking the audit, possibly due to the existence of a nutrition screening policy within the trust. Other trusts are encouraged to undertake similar audit to draw attention to the importance of nutritional screening and the need to undertake it more accurately.

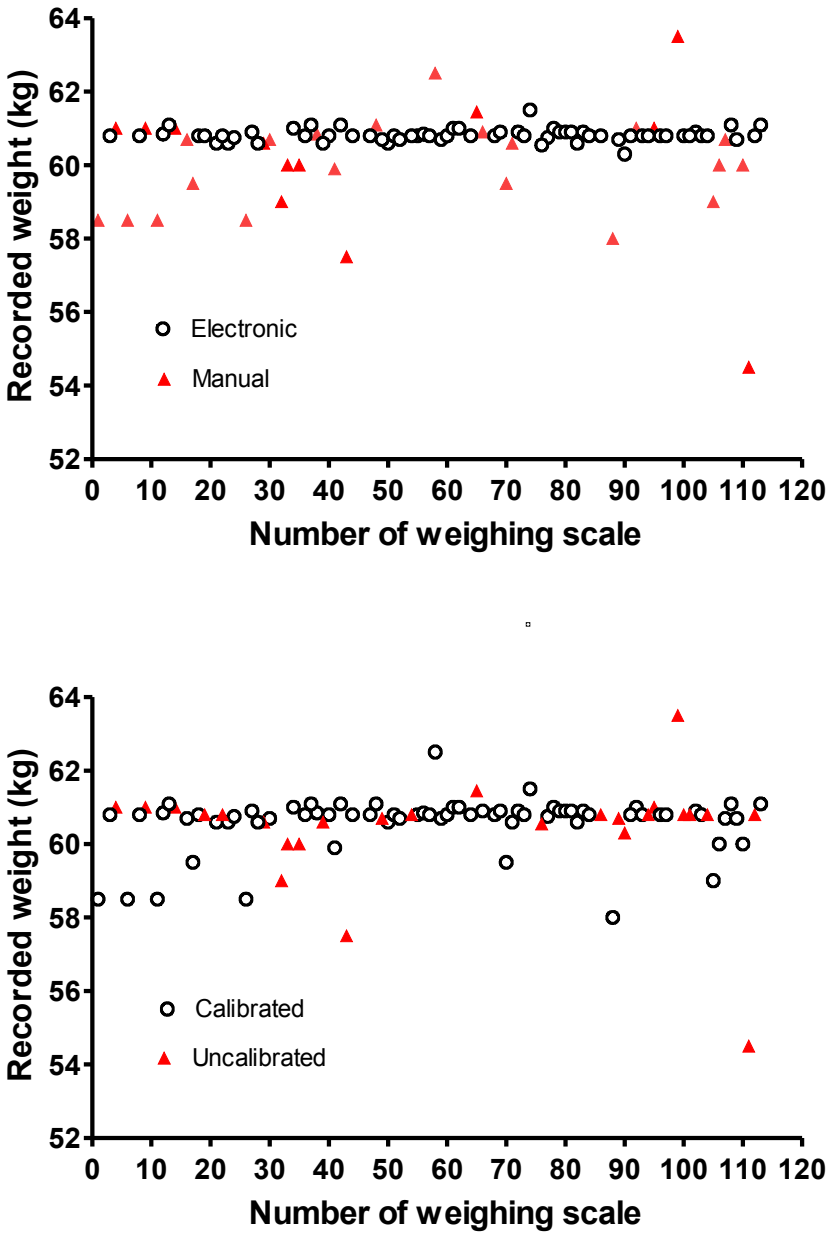

Figure. Weights recorded by weighing scales *Upper graph* according to type of scale (manual or electronic) *Lower graph* according to calibration status (calibrated or uncalibrated in the previous year).

References

Acknowledgement
We wish to thank the Nutrition Education Team.