



# MARSDEN

Weighing up the risks: the importance of accurate weight measurement in clinical environments

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## INTRODUCTION

Measuring and recording accurate patient body weight plays a fundamental role in hospital-based care. It is a vital tool in monitoring fluid balance, calculating medication dosage, nutritional treatment and gauging whether specialist equipment such as profiling beds may be needed. It is also a key measure of a patient's overall health and wellbeing, and is instrumental in managing patient safety. Weight should not be a singular event on admission but used as an important tool for ongoing assessment throughout the patient's health journey.

NICE (2006) Guidelines state that each patient should have their weight measured on admission, and weekly thereafter. However, research has shown that just 6% of hospitals screen 75-100% of patients for weight, and only 49% record patients weights across all ward's.<sup>1</sup> A further study found that bodyweight measurements are recorded in only 13.5–55% of hospital patients.<sup>2</sup>

Physical weighing can sometimes prove difficult due to ward pressures, lack of suitable equipment and patient presentation. Weight measurement can also be perceived as a routine task, and therefore allocated to staff without appropriate training or experience. As a result of all these factors, estimating weight has become common practice amongst clinicians.

However, the risks associated with this are significant, adversely impacting patient outcomes, resulting in the requirement for more complex care interventions, and in worst case scenarios can prove fatal.

Inconsistencies in recording patient body weight, as well as using inaccurate or inappropriate weighing equipment, can have a negative impact on patient care<sup>3</sup>.

This can increase the risk of errors in diagnosis, interventions, treatment or medication dosage<sup>4</sup>.



## WHERE DOES WEIGHT ESTIMATION HAPPEN?

There are various instances when direct measurement of body weight can prove challenging:

- The need for emergency treatment, for example stroke patients
- Frailty
- Immobility
- Trauma
- Burns
- Non-verbal patients
- Unconsciousness
- Capacity and consent
- Patient resistance

Nurses claimed that they no longer weigh patients due to it being personal to ask an individual and the increasing strain which has been put on nurses over the years. It is usually tasked to unqualified staff members and more often than not the apparatus is faulty.<sup>5</sup>

### KEY STATISTICS

A study in 2009 concluded that dietitians were able to accurately predict patients' body weight within 2 kg in no more than 30% of patients.<sup>6</sup>

Nurses estimation for weight and height is not accurate; one in four nurse participants classified the bed confined patient into the wrong BMI category.<sup>7</sup>

Estimation of weight in ICUs has been found to be poor, 47% of estimates at least 10% different and 19% of estimates at least 20% different from the measured values.<sup>8</sup>

A study asking physicians and nurses to estimate critically ill patients weight found errors greater than 20% in 24% of cases.<sup>9</sup>

A telephone survey of 20 ICUs in the United Kingdom indicated only two measured patients weight.<sup>10</sup>

## WHAT ARE THE RISKS?

Accurate weight is required to calculate correct dosages for many commonly administered medications, and this is especially important for medications with a narrow therapeutic index which are more likely to cause adverse drug events (ADEs).<sup>11</sup> Weight is also vital to be able to calculate appropriate doses for anaesthetic, chemotherapy and radiation treatment.

Overestimating weight can lead to overdosing and subsequent toxicity. Conversely underestimation can result in suboptimal therapeutic effects. For example, the commonly used antimicrobial vancomycin requires initial doses to be calculated based on a patient's weight, as well as their kidney function. Underdosing may not effectively treat the target infection while overdosing may impair renal function, and several case studies have described unintentional overdoses requiring hemodialysis.<sup>12,13</sup>

Likewise, the main side effects of gentamicin, used commonly in haematology, oncology and neonatal, are dose-related and include nephrotoxicity, audio damage and irreversible toxicity. A study undertaken in a London NHS hospital found that using online dose calculators which calculated appropriate doses and frequency based on their weight and creatinine clearance resulted in gentamicin dose errors falling from 61.5% to 44.2%.<sup>11</sup>

Research carried out by the Institute of Cardiovascular Research at Royal Holloway, University of London and St Peters Hospital in Chertsey found that 19.7% of stroke patients received an incorrect dose of recombinant tissue-type plasminogen activator due to the inaccuracy of clinicians estimation of weight. At discharge, these patients had on average 10% poorer outcomes.<sup>14</sup>

In a study of cardiac patients in Scotland prescribed LMWH, weights were either not recorded or estimated incorrectly by staff or patients, leading to dosing errors in 49% of cases. 43% of doses were found to be excessive after the drug had already been administered.<sup>15</sup>

Inaccurate weight recording can also cause haemorrhagic complications. An Australian study found 43.7% of patients administered therapeutic anticoagulation who were not weighed experienced blood loss, whereas no patients who were weighed did so. Among the affected group, 71.4% were classified as major haemorrhagic complications, where there was a

haemoglobin drop of >20 points or intervention required.<sup>2</sup>

In addition to drug dosage and infusion rates being based on bodyweight, intensive care unit (ICU) scoring systems such as SOFA (Sequential Organ Failure Assessment) also rely on accurate measurement of the patient's weight. A study from Aberdeen Royal Infirmary and the Health Services Research Unit, University of Aberdeen found that the estimation of weight in the ICU was poor, with 47% of estimates at least 10% different and 19% of estimates at least 20% different from the measured values.<sup>16</sup>

According to a Nursing Times assessment, one in three people admitted to hospital are already malnourished.<sup>15</sup> Regular and accurate weighing of patients is essential on admission, and onwards to enable dietetic assessments and ensure the most appropriate level of nutrition is provided, particularly for older patients, and of course those with eating disorders. Malnutrition is associated with multiple adverse patient outcomes including depression of the immune system, impaired wound healing, muscle wasting, extended hospital stay, higher treatment costs and increased mortality.<sup>18</sup>

Accurate patient weight is also essential to monitor fluid balance, which is of particular importance in critically ill patients and those with heart, liver or kidney failure to prevent clinical deterioration and associated increased mortality. The accurate and timely measurement of patient weight is essential in guiding fluid management in these cohorts, where maintaining optimal volume status is critical. Increasing weight in a haemodialysis patient can indicate fluid accumulation, and studies have found an association between chronic fluid overload and increased mortality risk.<sup>18</sup>

Obesity can have a significantly impact on patient outcomes in a number of areas. Overweight patients are at increased risk of medical complications such as myocardial infarction, wound infection and nerve injury. Weighing patients can provide an objective measurement to enable appropriate pre-operative measures, and ensure specialist care and equipment e.g. bariatric beds and hoist transfers, can be put in place.<sup>2</sup>



## ADDRESSING THE RISKS

There are a range of challenges associated with measuring and recording patient weight, but equally there are a number of approaches and solutions to address these, which can be categorised as below:

### APPROPRIATE WEIGHING EQUIPMENT

A range of weighing equipment is available, enabling the appropriate scale to be chosen according to the task:

<b>BABY SCALES</b>	Maternity departments, community midwives and health visitors.
<b>CHAIR SCALES</b>	All wards, outpatient departments, clinics, A&E and care homes.
<b>COLUMN AND STAND ON SCALES</b>	All areas where patients are able to stand to obtain a weight. This may be in clinics, pre-assessment, general wards, theatre admissions and maternity.
<b>HOIST WEIGHING ATTACHMENTS</b>	Any department within the hospital where there are immobile patients, who can be manoeured into a hoist.
<b>PATIENT TRANSFER SCALE</b>	The Patient Transfer Scale should be used to gain a quick and accurate weight readings for patients who are immobile or too sick to stand. The device can be used as part of an existing lateral transfer process.
<b>WHEELCHAIR SCALE</b>	Any department where the patient presents in wheelchair for example, outpatient clinics, care homes for use when in wheelchair, patients in their own home unable to stand on scales.

## ACCURATE

Medical weighing equipment is covered in Schedule 3 of the Non Automatic Weighing Instrument Regulations, and in healthcare premises it is a legal requirement to use a minimum of Class III category weighing scales, although only two thirds of hospitals are aware of standards regarding weighing scales.<sup>20</sup>

We recommend that weighing scales should:

- Be CE marked
- Carry a green M label
- Be procured centrally
- Be marked with a four digit number indicating who is responsible for verifying the equipment
- Be able to display weight in metric units
- Be subject to annual testing<sup>21</sup>

Regular calibration is also important, especially as during the course of usage their location can be moved, resulting in physical impacts that can affect accuracy. An NHS study found that 22% of scales were not set to zero, and a third of all scales tested were inaccurate.<sup>22</sup> A survey by the British Association for Parenteral and Enteral Nutrition (BAPEN) also found that only 70% of hospital weighing scales had been calibrated in the previous 12 months.<sup>20</sup>

## ACCESSIBLE

Locating equipment suitable for the individual patient can form a barrier to its use, particularly where ward pressures are high or when door to needle time is of the essence. It's vital to ensure all staff are aware not only of which weighing devices are suitable for which cohort, but that devices can be easily located for use, and can be obtained in a timely manner when required.

## AWARENESS

As vital as it may be to have appropriate and accurate equipment available, this will remain ineffective unless staff are aware of how and when to use it. An audit in 2009 found that many hospital staff were not correctly trained in how to use weighing equipment.<sup>23</sup> Staff should be given specific and ongoing training regarding what equipment is appropriate in which scenario, and trained in its use, this ensures staff confidence and consistency in patient care. Staff must also understand the impact of patient weight, and how even relatively small changes can be clinically relevant.

## ACCEPTABILITY

A major reason for not weighing patients is that clinical staff wish to avoid causing distress with a procedure that they perceive as unnecessarily invasive, and that they believe won't impact on treatment or patient outcomes.<sup>16</sup> In a qualitative study in a UK hospice, 55% of staff did not wish to weight patients as they felt the patients shouldn't be thinking about their weight during palliative care. However, in the same study, 98% of patients felt that getting weighed was not upsetting, 89% wanted to be aware if their weight was changing, and 84% wished to be weighed at future hospital appointments.<sup>24</sup> This illustrates a divergence between clinical and patient perception, and the importance of patient input into clinical procedures.



## THE SUMMARY

Weighing equipment is an essential monitoring and diagnostic tool. It provides vital information for calculating appropriate medication, managing malnutrition and eating disorders, measuring fluid retention and informing treatments such as chemotherapy. Even perceived minor changes in weight can be clinically significant, and can have a direct link to outcomes, patient experience and the cost of interventions.

Failing to weigh patients accurately can have a substantial negative impact on diagnosis and treatment, and yet this vital aspect of patient safety is rarely prioritised. Over and above this, it is a legal requirement to have weighing equipment that is accurate and fit for purpose in healthcare premises.

This is not just a UK issue; a multi-centre study in the US revealed that only 65.7% of patients were

weighed within the first 36 hours of admission,<sup>25</sup> and in Australia hospital staff inaccurately estimate weight approximately 50% of the time.<sup>2</sup>

Accurate weight measurement can also contribute to cost avoidance. The NHS spends around £16 billion a year on drugs<sup>26</sup> and it's estimated £300 million of prescribed medicines are wasted each year.<sup>27</sup> With an excess bed day in the NHS costing between £2,089 and £2,532 a week<sup>28</sup>, ensuring accurate weighing can have a significant impact on reducing drug wastage, litigation and length of stay, helping to make best use of NHS resources.

The challenges to accurate weight measurement can be easily addressed, with accurate, accessible and well maintained equipment, alongside increased staff awareness of the importance of weighing patients, as well as regular training.

# OUR SOURCES

<sup>1</sup> Russell CA, Elia M, on behalf of BAPEN and Collaborators (2007) Nutrition Screening Survey in the UK in 2007. RCN: Enhancing Nutritional Care

<sup>2</sup> Recording patient bodyweight in hospitals: are we doing well enough? Kate M. Flentje , Colin L. Knight, Ingrid Stromfeldt, Anindita Chakrabarti and N. Deborah Friedman. Department of General Medicine, University Hospital Geelong, Geelong, Victoria, Australia

<sup>3</sup> Clarkson, 2012 <https://www.nursingtimes.net/clinical-archive/assessment-skills/accurate-assessment-of-patient-weight-14-03-2014/>

<sup>4</sup> Department of Health, 2010; Local Authorities Coordinators of Regulatory Services (LACORS), 2009

<sup>5</sup> <https://www.nursingtimes.net/clinical-archive/assessment-skills/accurate-assessment-of-patient-weight-14-03-2014/>

<sup>6</sup> <https://www.cambridge.org/core/journals/proceedings-of-the-nutrition-society/article/are-dietitians-able-to-estimate-patients-weight-accurately/89049EEC04CDEEFD5A00F58493973389>

<sup>7</sup> Bart Geurden a,b\*,e , Erik Franck a,b,e,f , Joost Weyler c,g , Dirk Ysebaert, e-SPEN, the European e-Journal of Clinical Nutrition and Metabolism, Accepted 25 June 2011 [https://clinicalnutritionespen.com/article/S1751-4991\(11\)00042-4/pdf](https://clinicalnutritionespen.com/article/S1751-4991(11)00042-4/pdf)

<sup>8</sup> (Crit Care Med 2006; 34:2153–2157) [https://portalbiocursos.com.br/ohs/data/docs/57/98-Accuracy\\_of\\_weight\\_and\\_height\\_estimation\\_in\\_an\\_intensive\\_care\\_unit\\_\\_Implications\\_for\\_clinical\\_practice\\_and\\_research.pdf](https://portalbiocursos.com.br/ohs/data/docs/57/98-Accuracy_of_weight_and_height_estimation_in_an_intensive_care_unit__Implications_for_clinical_practice_and_research.pdf)

<sup>9</sup> Accuracy of Weight and Height Estimation in an Intensive Care Unit  
Dr L. P. Maskin, M.D., S. Attie, M.D., M. Setten, M.B., B.S., First Published September 1, 2010 Research Article Find in PubMed  
<https://doi.org/10.1177/0310057X1003800519>

<sup>10</sup> [https://portalbiocursos.com.br/ohs/data/docs/57/98-Accuracy\\_of\\_weight\\_and\\_height\\_estimation\\_in\\_an\\_intensive\\_care\\_unit\\_\\_Implications\\_for\\_clinical\\_practice\\_and\\_research.pdf](https://portalbiocursos.com.br/ohs/data/docs/57/98-Accuracy_of_weight_and_height_estimation_in_an_intensive_care_unit__Implications_for_clinical_practice_and_research.pdf)

<sup>11</sup> Hamad, A. and Cavell, G. and Hinton, J. and Wade, P. and Whittlesea, C. (2015) 'A pre\_postintervention study to evaluate the impact of dose calculators on the accuracy of gentamicin and vancomycin initial doses.', BMJ open., 5 (6). e006610.

<sup>12</sup> Gutiérrez-Sánchez MJ. Letters to the Editor Rapid Response to High and Plasma Cells Efficacy of High Permeability Haemodialysis in Acute Renal Failure Due To. 2014;3-5. doi:10.3265/Nefrologia.pre2014.Jun.12108

<sup>13</sup> Walczyk MH, Hill D, Arai A, Wolfson M. Acute Renal Failure Owing to Inadvertent Vancomycin Overdose Vancomycin Removal by Continuous Arteriovenous Hemofiltration. 1988;18(6):440-443.

<sup>14</sup> T. Barrow, M. S. Khan, O. Halse, P. Bentley, P. Sharma. Estimating Weight of Patients With Acute Stroke When Dosing for Thrombolysis. Stroke, 2015; DOI: 10.1161/STROKEAHA.115.011436

<sup>15</sup> Spicer K, Gibson P, Bloe C, Cross SJ, Leslie SJ. Weight assessment in cardiac patients: implications for prescription of low molecular weight heparin. Postgrad Med J 2009; 85: 124–7.

<sup>16</sup> Accuracy of weight and height estimation in an intensive care unit: Implications for clinical practice and research. Roxanna Bloomfield, MB ChB, FRCA; Elizabeth Steel, MB ChB, FRCA; Graeme MacLennan, MSc; David W. Noble, BMedBiol, MB ChB, FRCA

<sup>17</sup> <https://www.nursingtimes.net/clinical-archive/assessment-skills/accurate-assessment-of-patient-weight-14-03-2014/>

<sup>18</sup> Barker LA, Gout BS, Crowe TC. Hospital malnutrition: prevalence, identification and impact on patients and the healthcare system. Int J Environ Res Public Health 2011; 8: 514–27.

<sup>19</sup> <https://www.ausmed.co.uk/cpd/articles/fluid-balance-charts>

<sup>20</sup> BAPEN Nutrition Screening Survey in the UK and Republic of Ireland in 2011, C A Russell and M Elia

<sup>21</sup> Good Practice Guideline, Obtaining an Accurate Body Weight Measurement in Adults and Children in Primary and Secondary Care Settings, National Nurses Nutrition Group, February 2017

<sup>22</sup> Martin, Daniel. "Hospital Weighing Scales Put the Health of Millions of NHS Patients at Risk." Mail Online. Associated Newspapers, 8 Nov. 2008. Web. 31 Dec. 2015. <http://www.dailymail.co.uk/news/article-1082796/Hospital-weighing-scales-health-millions-NHS-patients-risk.html>.

<sup>23</sup> <https://www.nursingtimes.net/clinical-archive/assessment-skills/accurate-assessment-of-patient-weight-14-03-2014/>

<sup>24</sup> Watson M, Coulter S, McLoughlin C, Kelt S, Wilkinson P, McPherson A et al. Attitudes towards weight and weight assessment in oncology patients: survey of hospice staff and patients with advanced cancer. Palliat Med 2010; 24:623–9.

<sup>25</sup> Jensen GL, Friedmann JM, Henry DK, Skipper A, Beiler E, Porter C et al. Noncompliance with body weight measurement in tertiary care teaching hospitals. JPEN J Parenter Enteral Nutr003;27:89–90.

<sup>26</sup> <https://www.england.nhs.uk/five-year-forward-view/next-steps-on-the-nhs-five-year-forward-view/funding-and-efficiency/#:~:text=Get%20best%20value%20out%20of,NHS%20England's%20specialised%20services%20budget>.

<sup>27</sup> <https://www.england.nhs.uk/wp-content/uploads/2015/06/pharmaceutical-waste-reduction.pdf>

<sup>28</sup> Reference Cost Collection: National Schedule of Reference Costs - Year 2015-16 - NHS trust and NHS foundation trusts (<https://www.gov.uk/government/publications/nhs-reference-costs-2015-to-2016>).



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