



Red Cell Dosage *Calculator*

User Guide



S. Grey, Version 3 (2024) Ref: BT-SW-17



Class 1 Medical Device –
Decision Support Software

Introduction

- Empiric red cell dosing in non-bleeding patients with normovolaemic anaemia can lead to under or over-transfusion when aiming to meet a post-transfusion haemoglobin target, especially when the patient's body weight is not accounted for. This is a significant risk for Transfusion-Associated Circulatory Overload (TACO).
- It is always important to clinically re-evaluate patients after a single unit of red cells regardless of the total number administered. Repeat haemoglobin testing between units has a time and resource impact. This could be avoided if the volume required to meet the target haemoglobin level could be reliably predicted in the context of body weight, for patients with acute anaemia [NICE, NG24; NBTC Indication Codes, 2020]
- A web app was developed, technically validated and **UKCA marked as a class 1 medical device** in 2016 by Bolton NHS Foundation Trust, and clinically implemented in 2017 (version 1), and redeveloped in 2019 which would allow sharing with other NHS organisations (version 2). A further update in 2024 was released to strengthen appropriate management of severe chronic anaemia, and strictly reflect haemoglobin targets in acute coronary syndrome/myocardial infarction.

Computer says no?

- The calculator may well sometimes be contrary to the clinician's view but the calculator is intended to give the best guidance to prescribe sufficient red cells to meet a target Hb in patients with acute anaemia. We know that patients may be symptomatic on the margins of the transfusion triggers (70g/L or 80g/L) which is why a 5g/L 'tolerance' is built into the calculator to mitigate this.
- Importantly, the Red Cell Dosage Calculator is **Decision-Support Software**. There may be a good clinical reason to prescribe a different volume: for example, if two units is the calculated dose but you feel the patient is at risk of circulatory overload and only wish to give one unit, this is clinically justified and can be documented. Another scenario may be a patient with acute coronary syndrome where transfusion is clinically guided by the risk of ongoing cardiac ischaemia versus the risk of transfusion overload.
- A **Transfusion-Associated Circulatory Overload (TACO)** risk assessment should be performed before every transfusion episode, and this should also be part of the decision on the appropriate red cell volume to prescribe.

Is it effective?

- After the first month of implementation at Bolton NHSFT, 56% of red cell issues had evidence of the App being used to calculate the dose, rising to 88% by month nine. There were 581 red cell transfusions where patients received the same number of units as calculated by the web app. One hundred and forty-five were excluded from the data because there was either no post-transfusion haemoglobin value, were found to be bleeding on retrospective audit, had profound anaemia and would have required more than two units to reach their target haemoglobin, or received fewer units than calculated and issued.
- Of the remaining 436 cases, 388 (89%) reached their post-transfusion target haemoglobin level. Twenty-four cases (5.5%) did not meet the target, and 24 (5.5%) exceeded the target. At financial month 8 (2017/18), 3016 units had been transfused in total with a prediction that 3348 would be transfused for normovolaemic anaemia by financial year end, representing a projected 16.5% reduction in red cell usage (18% actual).

The App can be hosted on an organisation's intranet page

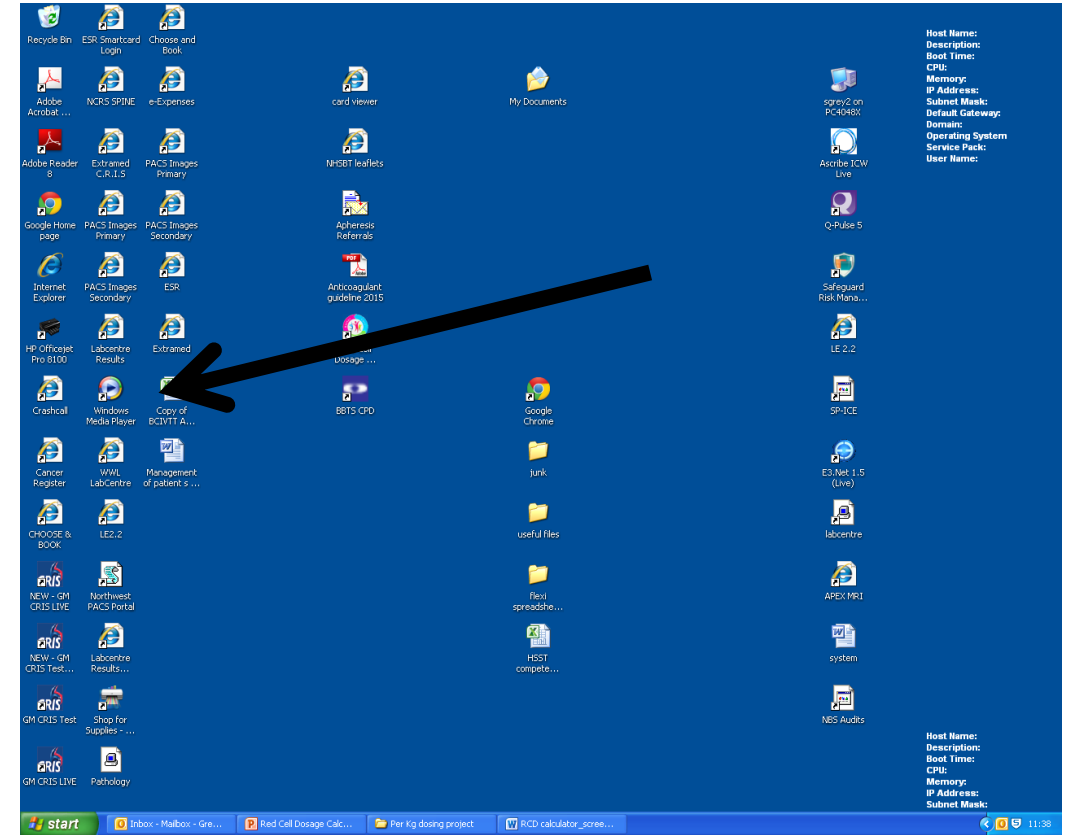
The screenshot displays the Bolton NHS Foundation Trust intranet homepage. At the top, there is a navigation bar with a search bar and a user profile for Karen Farrar. The main content area is divided into several sections:

- Survey Update:** A large tile showing a survey completion rate of 28.58% and a progress chart. Below it, text indicates the survey update week commencing Monday 9th November.
- Staff Update:** Two tiles featuring a row of staff avatars and the text "Staff Update" followed by dates and times: "Staff update (105) 09.11.20" and "Staff update (104) 06.11.20".
- Performance:** A section titled "Performance" containing a large "Black" alert with a black circle icon. The text reads: "Trust Escalation Status BLACK 10.11.20 @ 9am." by Caroline Swaby, 4 years ago.
- New on BOB...:** A section listing various news items, including "RCP Look Out! Bedside Vision Check", "TVN2gether Virtual Stop the Pressure 2020 Week 6", "Internal vacancy for a Workforce Information Project Officer", "GEM 5000 Quick Reminder Guide POCT-SW-64", "Ordering home oxygen for children discharged from the children's ward", and "Covid-19 swabbing advice for patients / persons with a Dementia diagnosis".
- Discussion Forums:** A section titled "Discussion Forums" is partially visible at the bottom left.
- Application Tiles:** A grid of application tiles is located at the bottom right, including "ANTIMICROBIAL GUIDELINES", "BNF", "Secure APPS", "Minerva", "Medusa", and "ROYAL". A black arrow points to the "Secure APPS" tile.

The page also features a Google search bar and a Windows taskbar at the bottom with the date 19/11/2020 and time 16:57.

Personal Desktop Access

- Enter the home page of the
- calculator and copy the url address
- Right click on your desktop
- Click 'New'...'Shortcut'
- Paste the url address
- Click 'next'
- Name the shortcut: 'Red Cell Dosage Calculator'
- Click 'finish'



Exclude Non-Appropriate Patients

To be used on all non-bleeding adult patients who are not transfusion-dependent

The screenshot shows a web browser window with the URL <https://test.rcdcalculator.co.uk/RcdCalculator/StepOneApplicabilityCriteria>. The page features the "Red Cell Dosage Calculator" logo and a "Contact Us" button. The breadcrumb trail is "Home / Applicability Criteria". The main heading is "1. Is the patient:" followed by a list of criteria:

- Actively bleeding? (NBTC indication code R1)
- On a regular transfusion programme? (NBTC indication code R4)
- An adult requiring exchange transfusion? (NBTC indication code R6)
- A paediatric or neonatal patient?

Below the list are three buttons: "Start Again", "Yes", and "No". The footer includes links for "Privacy Policy", "Cookie Policy", "Accessibility", and "Terms and Conditions", along with the copyright notice "©2024 Technical Solutions Worldwide Ltd.". Logos for UKCA and NHS Bolton (NHS Foundation Trust) are also present, with the text "Class I Medical Device (Decision Support Software)" below them. The Windows taskbar at the bottom shows the time as 16:40 on 03/05/2024, with a temperature of 13°C and light rain.

Enter Details...

The screenshot shows a web browser window with the URL <https://test.rcdcalculator.co.uk/RcdCalculator/StepTwoCauseOfAnaemia>. The page header includes the logo for 'Red Cell Dosage Calculator' and a 'Contact Us' button. The breadcrumb trail is 'Home / Applicability Criteria / Cause of Anaemia'. The main content area is titled '2. Is the patients cause of anaemia (select one):' and contains two radio button options:

- Chronic anaemia - not transfusion dependent.
 - Patient may be asymptomatic or minimally symptomatic despite severe anaemia and is haemodynamically stable.
- Acute anaemia (NBTC indication code R2/3).
 - Previous bleeding (now haemodynamically stable),
Surgical bleeding (now haemodynamically stable),
Acute bone marrow failure,
Acute bone marrow suppression due to chemotherapy (not transfusion dependent).

At the bottom of the form are 'Start Again' and 'Continue' buttons. The footer contains links for 'Privacy Policy', 'Cookie Policy', 'Accessibility', and 'Terms and Conditions', along with the UK and NHS logos. The Windows taskbar at the bottom shows the search bar, NHS logo, and system tray with weather (13°C Light rain) and date (03/05/2024).

Chronic Anaemia

RCD Calculator Cause of Anaemia

https://test.rcdcalculator.co.uk/RcdCalculator/StepTwoChronicAnaemiaNotTransfusionDependentAnswered

Home / Applicability Criteria / Cause of Anaemia

Check the red cell indices (MCV/MCH) on the full blood count (FBC):

- Microcytic / hypochromic suggesting iron deficiency.
- Macrocytic suggesting B12 / folate deficiency.
- Anaemia of chronic disease is usually normocytic or microcytic / hypochromic.

Confirm deficiencies with B12, folate, ferritin and iron profile (serum iron, transferrin saturation) testing.

**** Treat the underlying cause or deficiency ****

No universal transfusion trigger or target; physiological compensation means:
transfusion unlikely to be required if pre-transfusion haemoglobin is above 70 g/l.

Transfuse a **single unit** if necessary to prevent acute complications of severe anaemia
while the underlying cause is treated.

This patient is at additional risk of TACO – **perform TACO risk assessment.**

Start Again

Type here to search NHS

13°C Light rain 16:55 03/05/2024

Acute Anaemia – Hb target depends on whether the patient has acute myocardial infarction or acute coronary syndrome (per national guidelines)

RCD Calculator Red Cell Dosage

https://test.rcdcalculator.co.uk/RcdCalculator/StepThreeRedCellDosageCalculation

1. Applicability criteria.

The patient is **NOT** actively bleeding, not on a regular transfusion programme, not a transfusion for an adult receiving an exchange transfusion, and not a paediatric / neonatal patient.

2. Cause of anaemia.

The patient has acute anaemia (chronic anaemia has been excluded).

3. Does the patient have acute myocardial infarction / acute coronary syndrome? (select one)

Refs: NICE, NG24: NBTC indication codes, 2020 update.

Yes.

No.

4. Pre-Transfusion Haemoglobin and Body Weight. (complete both)

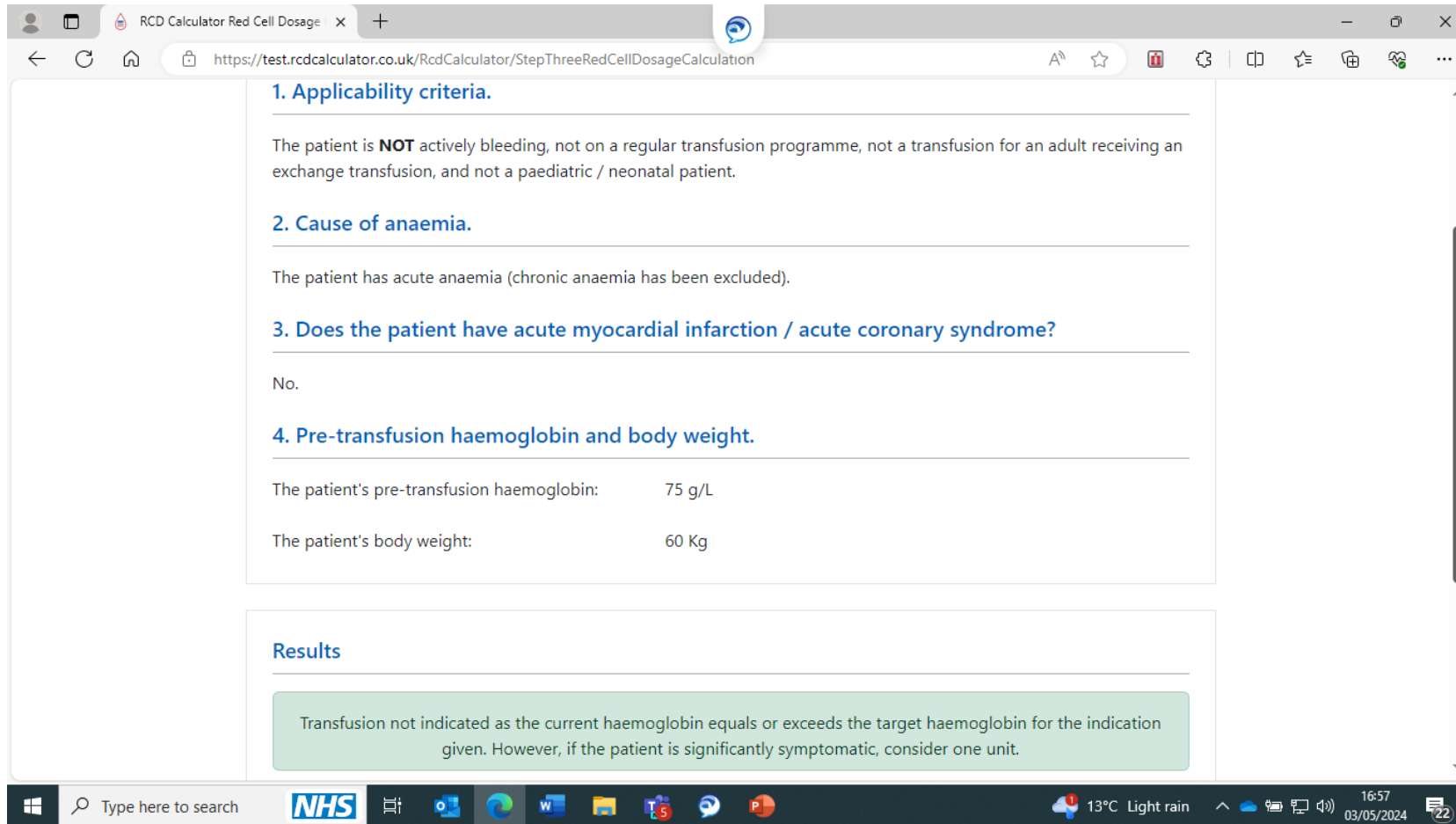
What is the patient's pre-transfusion haemoglobin? g/L

What is the patient's body weight? Kg

Type here to search NHS

13°C Light rain 17:07 03/05/2024

Example: Borderline Pre-Transfusion Hb



RCD Calculator Red Cell Dosage

https://test.rcdcalculator.co.uk/RcdCalculator/StepThreeRedCellDosageCalculation

1. Applicability criteria.

The patient is **NOT** actively bleeding, not on a regular transfusion programme, not a transfusion for an adult receiving an exchange transfusion, and not a paediatric / neonatal patient.

2. Cause of anaemia.

The patient has acute anaemia (chronic anaemia has been excluded).

3. Does the patient have acute myocardial infarction / acute coronary syndrome?

No.

4. Pre-transfusion haemoglobin and body weight.

The patient's pre-transfusion haemoglobin:	75 g/L
The patient's body weight:	60 Kg

Results

Transfusion not indicated as the current haemoglobin equals or exceeds the target haemoglobin for the indication given. However, if the patient is significantly symptomatic, consider one unit.

Type here to search NHS

13°C Light rain 16:57 03/05/2024

Example: >1 unit still requires clinical review after 1st unit

exchange transfusion, and not a paediatric / neonatal patient.

2. Cause of anaemia.

The patient has acute anaemia (chronic anaemia has been excluded).

3. Does the patient have acute myocardial infarction / acute coronary syndrome?

No.

4. Pre-transfusion haemoglobin and body weight.

The patient's pre-transfusion haemoglobin:	61 g/L
The patient's body weight:	95 Kg

Results

Calculated Dose = 342 mLs.

Required Number of Units of Red Cells = 2.

Transfuse 1 unit then re-evaluate the symptoms / haemoglobin before administering the second unit.

The screenshot shows a web browser window with the URL <https://test.rcdcalculator.co.uk/RcdCalculator/StepThreeRedCellDosageCalculation>. The page content includes a series of questions and answers related to a patient's condition and transfusion requirements. The final results are highlighted in a green box, indicating a calculated dose of 342 mLs and a required number of 2 units of red cells. A note below the results advises to transfuse 1 unit and re-evaluate symptoms and haemoglobin before administering the second unit. The Windows taskbar at the bottom shows the NHS logo, search bar, and system tray with the time 17:01 and date 03/05/2024.

Example: Low body weight patients

RCD Calculator Red Cell Dosage

https://test.rcdcalculator.co.uk/RcdCalculator/StepThreeRedCellDosageCalculation

The patient is **NOT** actively bleeding, not on a regular transfusion programme, not a transfusion for an adult receiving an exchange transfusion, and not a paediatric / neonatal patient.

2. Cause of anaemia.

The patient has acute anaemia (chronic anaemia has been excluded).

3. Does the patient have acute myocardial infarction / acute coronary syndrome?

No.

4. Pre-transfusion haemoglobin and body weight.

The patient's pre-transfusion haemoglobin:	69 g/L
The patient's body weight:	44 Kg

Results

Calculated Dose = 18 mLs.

This is less than the volume of a single unit of red cells. Consider whether transfusion is necessary.
If the patient is less than 50Kg, consider prescribing in mLs rather than units (and administer via a pump).

Type here to search NHS

13°C Light rain 17:03 03/05/2024

Comments and Help

- **Clinical Comments/Questions**
- (non-technical or non-contractual)
- htt@boltonft.nhs.uk

- **Technical and Contractual support:**
- Contact Technical Solutions Worldwide Ltd via the app website using the web form
- www.rcdcalculator.co.uk

- **Project Lead:**
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