

Gap Analysis of Pre-operative Anaemia Rates in Surgical Patients in SA Hospitals

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Aim: To examine the frequency of pre-operative anaemia in surgical patients in major SA public hospitals.

Methods

- > A linked electronic database for the SA public sector containing clinical, epidemiological, transfusion and laboratory data was used.
- > Adult patients undergoing total arthroplasty of hip (THA), total arthroplasty of knee (TKA), right and left sided colorectal surgery, coronary artery bypass grafting (CABG) and on-bypass cardiac valve replacement surgery during 2008–09 and 2009–10 financial years in five major metropolitan hospitals were included.
- > Haemoglobin (Hb) levels, red cell indices (MCV and MCH), serum ferritin (if available) and estimated glomerular filtration rate (eGFR) 8 weeks prior to the date of surgery were included in the analysis.
- > Pre-operative (Pre-op) Hb was defined as the last Hb measure prior to surgery but within the preceding 8 weeks.
- > Anaemia was defined as Hb levels below the laboratory reference range: < 135g/l for men and <115g/l for women.
- > There were 3 types of admission categories in the dataset:
 - Elective – admission of a patient which can be delayed for at least 24 hours
 - Elective booking list – admission of a patient from a designated booking list for surgery
 - Emergency – admission of a patient for treatment which is necessary and should occur within 24 hours.

Results

- > A total of 2821 admissions were identified during the two financial years. Table 1 summarises the admissions by procedure and admission categories.
- > There were 530 admissions for THA and 643 for TKA, 305 left-sided and 332 right-sided colorectal surgical procedures, 621 CABG and 390 on-bypass cardiac valve replacements.
- > The study cohort overall had a median age of 69 years with an inter-quartile range (IQR) of 60–77 years, with a median age for males of 67 years (IQR 58–75), and females 71 years (IQR 62–78). 53% of admitted patients were males.
- > The overall rate of pre-op anaemia in the study cohort was 28% (778/2821). The rate of pre-op anaemia was highest amongst patients having right-sided colorectal surgery (55%) followed by cardiac valve surgery (32%) and CABG (29%). In orthopaedic surgery, patients undergoing THA had a higher rate of pre-op anaemia (22%) than the patients who had TKA (14%) (Figure 1).
- > 36% (538/1504) of males were anaemic compared to 18% (240/1077) of females. Using WHO definitions of anaemia, 27% (402/1504) of males had a Hb level <130g/L and 27% (353/1317) of females had a Hb level <120g/L.
- > Rates of pre-op anaemia increased with age, were present in 20% of admitted patients <65 years old, in 31% of patients 65–85 years old and in 44% of patients >85 years old.
- > 14% of patients with pre-op anaemia were microcytic (MCV <80) and 23% were hypochromic (MCH <27pg) suggesting a significant proportion of these patients had iron deficiency anaemia as the underlying cause. Low red cell indices in anaemic patients were highest in right sided colorectal procedures, consistent with iron deficiency due to chronic occult GI blood loss.
- > In non-anaemic patients, 2.4% were microcytic and 5.3% were hypochromic, suggestive of deficient iron stores or underlying haemoglobinopathy, with rates of microcytosis (13%) and hypochromia (17%) highest in right sided colorectal procedures, again consistent with depleted iron stores due to chronic occult GI blood loss.
- > In patients with pre-op anaemia, impaired renal function was common, with 17.5% having an eGFR <45ml/min (eGFR < 15ml/min in 2%, eGFR of 15–29 in 4.5%, eGFR of 30–44 in 11%, eGFR of 45–60 in 19%).
- > Out of 2821 patients with recorded pre-op Hb levels, 83 (2.9%) did not have eGFR and 2807 (99.5%) did not have iron studies performed (by the state pathology service) in the 8 weeks prior to surgery. Of the 14 patients with iron studies performed, 7% (1/14) and 21% (3/14) had a serum ferritin less than 30 and 100mcg/L respectively.
- > A significantly higher proportion of admitted patients with pre-op anaemia were transfused in each surgical category compared to those without pre-op anaemia (Table 2). The transfusion rates varied by gender, pre-op Hb level and the type of surgery (Figure 2).

Table 1: Type of procedure and admission categories

	Elective	Elective booking list	Emergency
Cardiac (CABG & Valve)	80 (7.9%)	629 (62.2%)	300 (29.7%)
Colorectal (Left & Right)	9 (1.4%)	415 (65.1%)	208 (32.7%)
Orthopaedics (THA & TKA)	4 (0.3%)	1115 (95.1%)	53 (4.5%)
Total	93 (3.3%)	2159 (76.5%)	561 (19.9%)

8 admissions were not classified

Figure 1: Red Cell indices, pre-operative anaemia and overall transfusion rates in various procedures

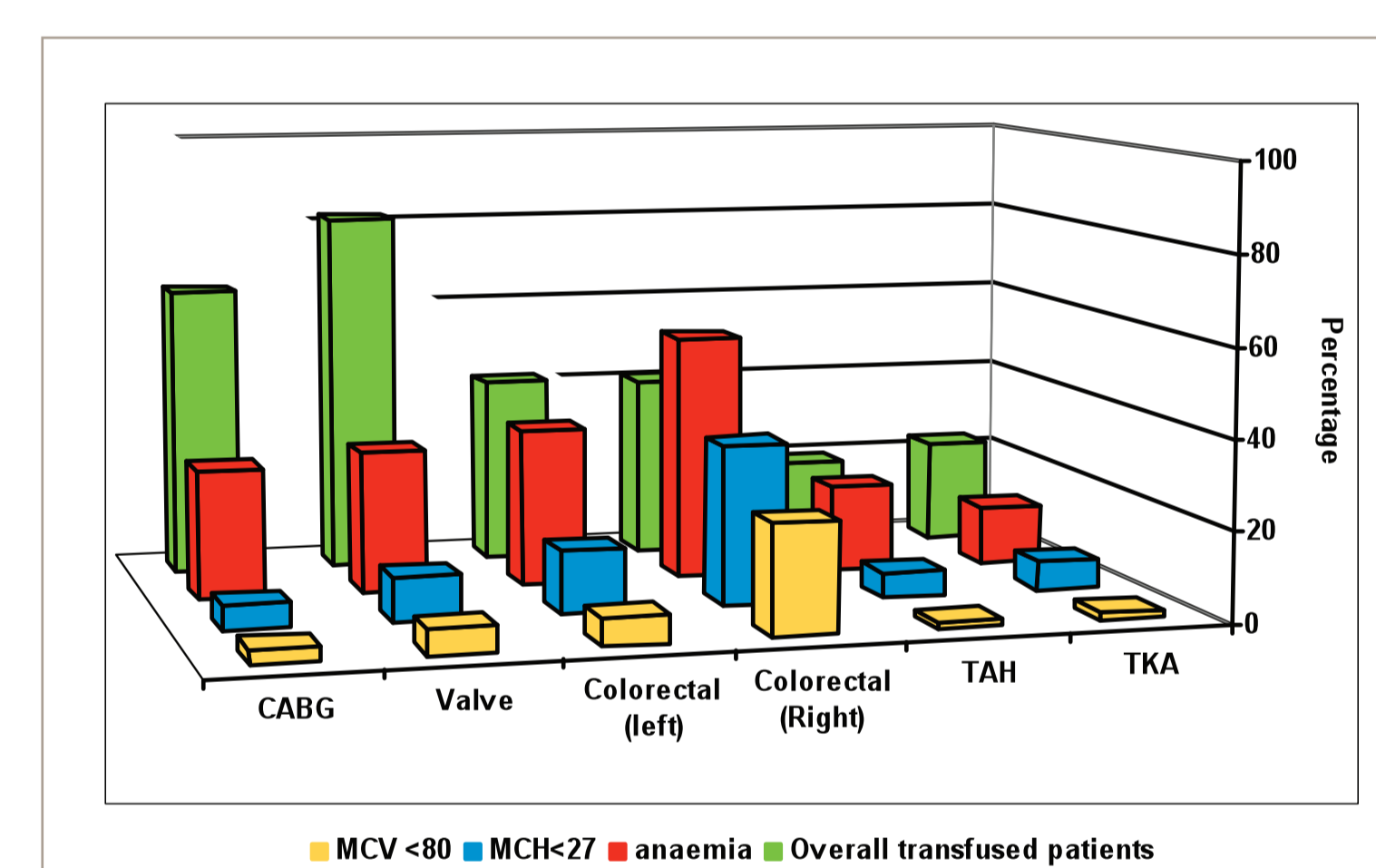
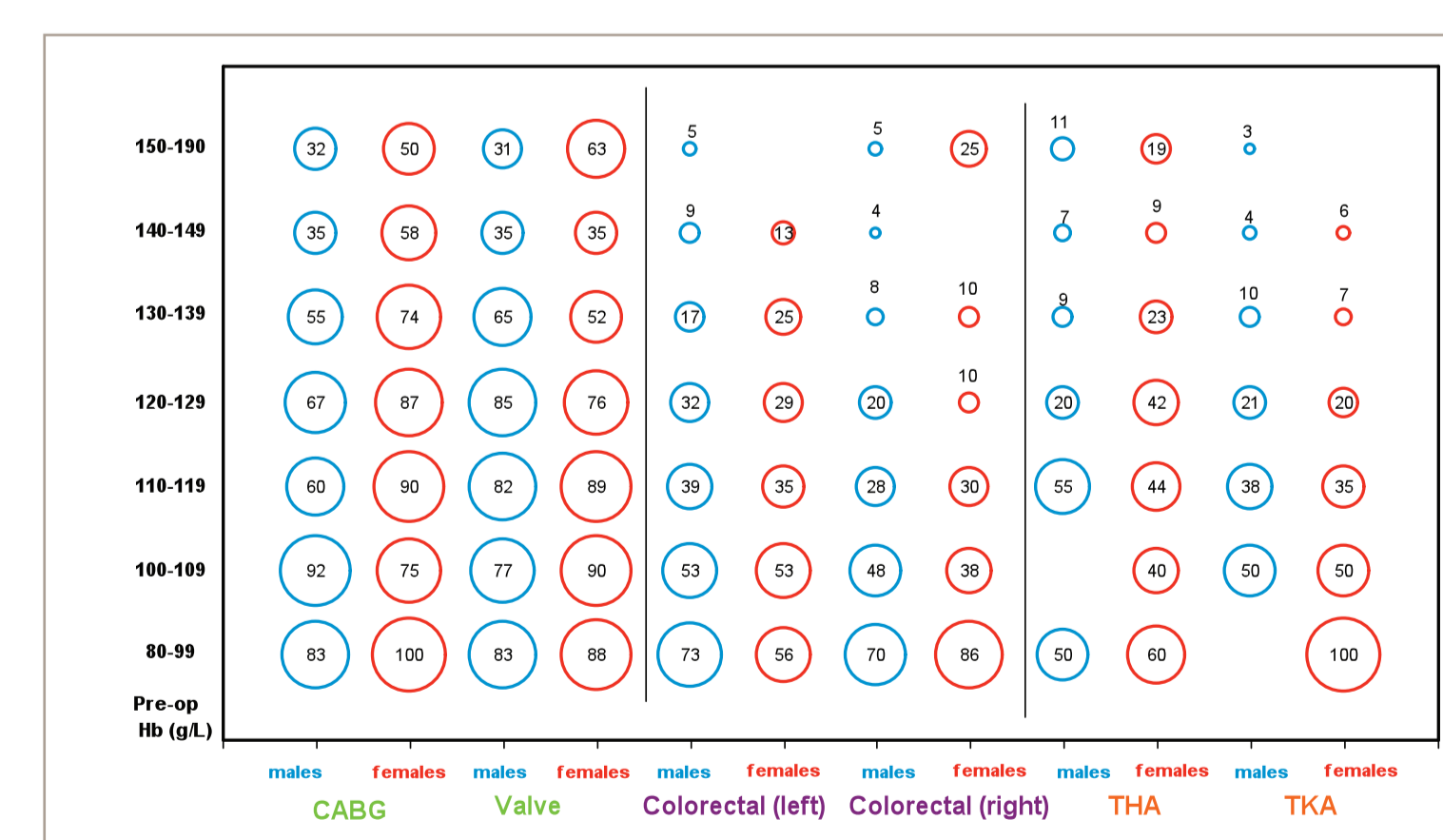


Table 2: Transfusion rates in admitted patients with pre-op anaemia compared to those without pre-op anaemia

	Anaemic	Non-anaemic	P value
CABG	92/141 (65.2%)	122/331 (36.9%)	<0.001
Valve	70/86 (81.4%)	60/159 (37.7%)	<0.001
Colorectal (Left)	34/81 (42.0%)	9/97 (9.3%)	<0.001
Colorectal (Right)	43/105 (41.0%)	3/59 (5.1%)	<0.001
THA	13/64 (20.3%)	14/146 (9.6%)	0.04
TKA	14/61 (23.0%)	7/174 (4.0%)	<0.001
Total	266/538 (49.4%)	215/966 (22.3%)	<0.001

Figure 2: Transfusion rates vs. pre-op haemoglobin values



Transfusion rates vary with types of surgery, gender and pre-op Hb levels. The actual percentage is contained within each bubble. Transfusion rates are higher in cardiac procedures, in females and with low pre-op haemoglobin.

Discussion

In our study the overall rate of pre-op anaemia was 27%, varying markedly between patient groups from 14% to 55% and with age, consistent with previous studies reported in the literature^{1,2}. The higher rate of both anaemia and low red cell indices in colorectal surgery, particularly right sided procedures, is consistent with pre-existing chronic blood loss leading to iron depletion.

However, low red cell indices, particularly MCH, were common in all groups suggesting underlying iron deficient red cell production. Iron studies were infrequently available before major surgery, as recommended in the DRAFT National Patient Blood Management (PBM) Peri-operative Guidelines³. A recent study in WA found that iron studies were commonly requested postoperatively despite many being anaemic at admission⁴.

Data linkage is a useful tool to allow planning of PBM initiatives, including the identification of number of patients who require assessment of pre-operative anaemia, the likely underlying cause of anaemia and the need for referral (e.g. haematology, gastroenterology and nephrology with implementation of anaemia management algorithms) and for the prioritisation of pilot programs.

Iron deficiency anaemia and depleted iron stores should be addressed to reduce the risks of transfusion and to determine the underlying cause (e.g. GI pathology) if this has not already been assessed.

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