

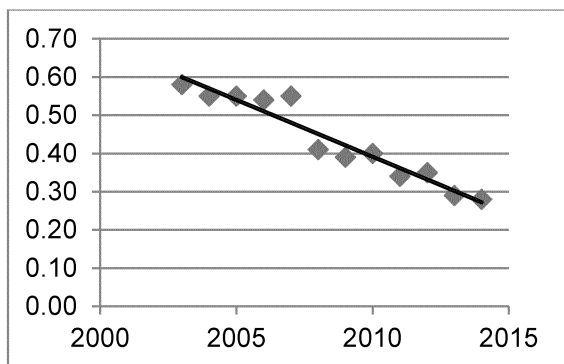
July 2015

RBC Transfusion Rate at Saint Luke's Hospital

As we reported in the January 2015 issue, The Center for Bloodless Medicine and Surgery at Johns Hopkins Hospital has demonstrated that patients who were managed by blood conservation suffered fewer deaths, infections and other morbidities compared to patients who were transfused (Clinical Anesthesiology, November 2014, volume 40:11).

Saint Luke's Hospital has been promoting blood management for more than 10 years. Most recently, the indications for transfusion were added to the blood component order set in EPIC along with a recommendation to consider a single unit RBC transfusion.

Recently, we reviewed our progress over the previous 12 years by calculating the number of RBC units transfused per inpatient discharge at Saint Luke's Hospital.



As illustrated in the graph, the transfusion rate has steadily decreased from 0.58 RBC per discharge in 2002 to 0.23 RBC in 2014. This data includes all inpatient transfusions.

As a reminder, the indications for RBC transfusion include:

- Hgb less than or equal to 7g/dL
- Symptomatic with hgb less than or equal to 8 g/dL
- Acute coronary syndrome, hgb less than or equal to 8 g/dL
- Acute massive blood loss of greater than or equal to 30% of estimated blood volume not corrected by volume resuscitation
- Non-elective Pre-surgery hgb less than or equal to 7g/dL, with anticipated blood loss of greater than or equal to 750 mL

Multiple Myeloma Criteria 2015

The availability of better drugs and sophisticated laboratory tests are the major driving factors to diagnose and treat multiple myeloma at an earlier stage, even in the absence of symptoms. The International Myeloma Working Group (IMWG) recently published new criteria for the diagnosis of multiple myeloma (MM) requiring therapy (*Lancet Oncology* 2014;15:e538-e548).

MM is usually preceded by monoclonal gammopathy of undetermined significance (MGUS) and/or smoldering MM. Plasma cell presentation in the bone marrow has always been part of the criteria for MM. Disease with $\geq 10\%$ of plasma cells and absence of any CRAB criteria (hypercalcemia, renal insufficiency, anemia, and bone lesions) features used to be called smoldering MM. Research has shown that patients with smoldering MM who had $\geq 60\%$ clonal plasma cells in the bone marrow have an 80% risk of developing one of the CRAB features within the next 2 years. The IMWG decided that patients who meet this threshold should be considered as having MM requiring therapy and started on treatment as if they had newly diagnosed MM defined by CRAB features.

Three different specimens are usually collected to assess plasma cell content: bone marrow biopsy, bone marrow aspirate, and flow cytometry. Of these, bone marrow biopsy is the best predictor of plasma cell tumor burden. CD138 should be used to estimate plasma cell burden. Although counting

plasma cells in bone marrow aspirate is easier, its sensitivity is lower compared with biopsy. Flow cytometry, is best for characterizing clonality of plasma cells but significantly underestimates the number of plasma cells in the marrow. The new IMWG criteria state that the highest number of plasma cells counted in the biopsy or aspirate is the number that should be used to determine if a patient has MM.

Plasma cells in the early stage of disease, like MGUS, do not make a lot of free light chains, whereas patients with advanced multiple myeloma often make surplus light chains. Serum free light chain (FLC) assay specifically detects the immunoglobulin light chains that are not attached to the heavy Ig chains. FLC ratio is the ratio of the involved to the uninvolved light chain. The light chain that is elevated is the one that is involved. The ratio is calculated by dividing involved by the uninvolved free light chain. For example, in patients with kappa light chain-producing neoplastic plasma cells, it is the kappa-to-lambda ratio. In contrast, the lambda-to-kappa ratio is reported for patients with lambda light chain producing cells.

Serum FLC ratio correlates with plasma cell tumor burden and predicts clinical outcome. Nearly 80% of patients with a FLC ratio of ≥ 100 will progress to symptomatic MM within a 2-year period. Serum FLC ratio has been added to the new IMWG criteria. According to the new IMWG, patients with a FLC ratio of ≥ 100 have MM requiring therapy, even in the absence of CRAB criteria.

The third change added to the new IMWG criteria involves imaging. Historically, skeletal surveys have been done as part of the workup of MM. The new criteria added MRI without contrast. Patients with ≥ 2 focal lesions in the bone are considered to have MM.

IMWG also updated some of the CRAB criteria. The C in CRAB, which stands for hypercalcemia, did not change. A plasma calcium level of >11.5 mg/dL still indicates hypercalcemia in the context of MM. The R in C-R-A-B stands for renal failure. The old criteria included only a serum creatinine of >2 mg/dL as the criteria for renal failure in MM. The new IMWG criteria added eGFR of <40 mL/min

calculated by either the MDRD or CKD-EPI formulae. Either serum creatinine or eGFR can be used. The A in CRAB means anemia. This criterion did not change. A hemoglobin of <10 g/dL or a 2 g/dL decrease below normal indicates anemia in MM. The B in CRAB stands for bone lesion. One or more bone lesions that are >5 mm either by skeletal survey or the CT portion of a PET scan is considered evidence of bone disease.

Hopefully, the new criteria will lead to earlier diagnosis and better outcomes for patients with MM.

Effectiveness of Tdap Vaccine in the Prevention of Pertussis

Pertussis, which is commonly called whooping cough, is caused by infection with *Bordetella pertussis*, or occasionally *B. parapertussis*. *Bordetella* species are fastidious gram-negative coccobacilli. Transmission occurs through direct contact with discharge from respiratory mucous membranes of an infected person. The incubation period is usually 7-10 days after exposure. Pertussis is highly communicable, infecting 80-90% of susceptible contacts. From the onset of symptoms, the disease can take 6-8 weeks to resolve.

The incidence of infections with *Bordetella pertussis* has been increasing in the United States. More than 48,000 cases were reported in 2012. Many of these infections occurred in adolescents who were current with their Tdap vaccination.

Tdap vaccine includes tetanus toxoid, reduced diphtheria toxoid, and acellular pertussis. Immunity to pertussis after vaccination does not appear to be long lasting. According to a matched case-controlled study of patients during a 2012 pertussis epidemic in Washington State, the effectiveness of the Tdap vaccine against pertussis wanes within 2 to 4 years after vaccination. Only 34% of vaccinated adolescents were protected between 2 and 4 years after vaccination. Lack of long-term immunity to pertussis after Tdap vaccination appears to be a contributing factor in the increasing incidence of pertussis infection among adolescents (Acosta AM, et al. *Pediatrics*. 2015;135(6):981-989. doi: 10.1542/peds.2014-3358).